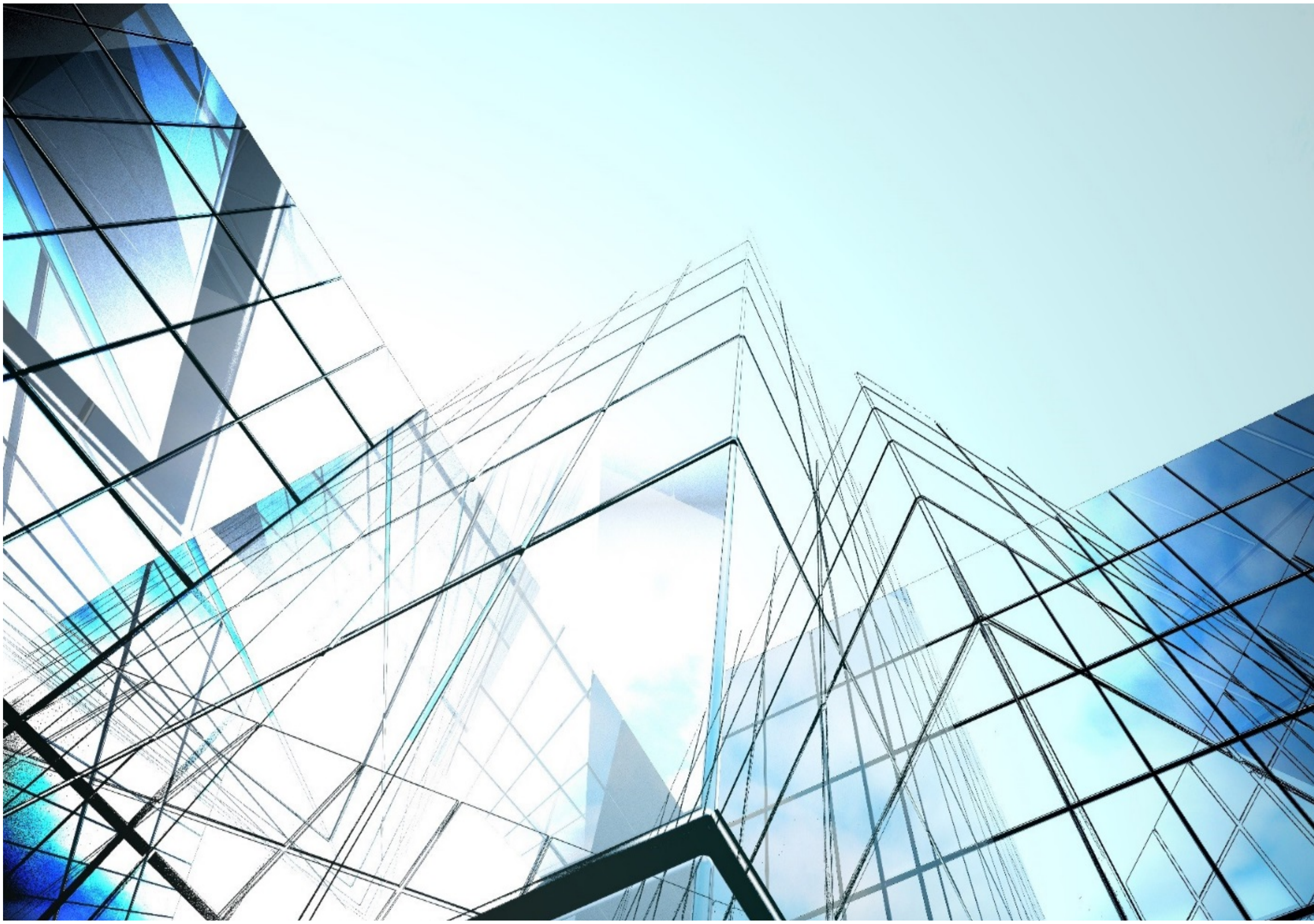

Univar Solutions USA Inc.

Stormwater Source Control Effectiveness Evaluation

3950 NW Yeon Avenue

May 2021

Project No.: 0577667

The business of sustainability

Signature Page

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Acronyms and Abbreviations

Name	Description
4,4'-DDE	1,1-dichloro-2,2-bis(4-chlorophenyl)ethene
4,4'-DDT	1,1,1-trichloro-2,2-bis(4-chlorophenyl)ethane
4,4'-DDD	1,1-dichloro-2,2-bis(4-chlorophenyl)ethane
1200-Z Permit	ODEQ NPDES Industrial Stormwater General 1200-Z Permit
µg	microgram
µg/L	micrograms per liter
BEHP	bis(2-ethylhexyl) phthalate
BMP	best management practice
CB	catch basin
CCV	continuing calibration verification
CMMP	Contaminated Media Management Plan
COIs	contaminants of interest
COP	City of Portland
cPAH	carcinogenic PAHs
CUL	cleanup level
DB	drainage basin
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
DDx	sum of DDD, DDE, and DDT isomers
EQ	exceedance quotient
ERM	Environmental Resources Management
IBC	intermediate bulk container
JSCS	Joint Source Control Strategy
MDLs	method detection limits
mg/kg	milligrams/kilogram
MRL	method reporting limit
NPDES	National Pollutant Discharge Elimination System
NW	Northwest
ODEQ	Oregon Department of Environmental Quality
PAH	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
pH	potential hydrogen
Property	3950 NW Yeon Avenue in Portland, Oregon
QAPP	Quality Assurance Project Plan
QA/QC	quality assurance and quality control
RCRA	Resource Conservation and Recovery Act
RM-9W	River Mile 9 West
ROD	Record of Decision
SLV	screening level value
SPCC	Spill Prevention Control and Countermeasure
SWSCE	Stormwater Source Control Evaluation
SWSCEE	Stormwater Source Control Effectiveness Evaluation
SWSCM	source control measure

Name	Description
TCE	trichloroethane
TSS	total suspended solid
Univar Solutions	Univar Solutions USA Inc.
USEPA	U.S. Environmental Protection Agency
VOCs	Volatile organic compounds

1 INTRODUCTION

ERM-West, Inc. (ERM) has prepared this Stormwater Source Control Effectiveness Evaluation (SWSCEE) on behalf of Univar Solutions USA Inc. (Univar Solutions) for the property located at 3950 NW Yeon Avenue in Portland, Oregon (the “Property”) (Figure 1). This SWSCEE is being submitted in accordance with the Amendment to Administrative Order on Consent to Implement Corrective Action (RCRA Docket No. 1087-10-18-3008[h]) (the “Amended Order”) for the site dated 1 August 2007, between the U.S. Environmental Protection Agency (USEPA) Region 10, and Univar Solutions.

This document describes the activities conducted in accordance with the Final Stormwater Source Control Measure (SWSCM) Work Plan (ERM 2018) to control contaminants of interest (COIs) to prevent sediment recontamination at the Portland Harbor Superfund Site via the stormwater pathway to the Willamette River.

1.1 Background

To evaluate and control potential adverse impacts to the Portland Harbor Superfund Site from industrial properties, the Oregon Department of Environmental Quality (ODEQ) and USEPA developed and jointly administer the Portland Harbor Joint Source Control Strategy (JSCS) (ODEQ and USEPA 2005). Individual upland property owners are required to identify, evaluate, and control sources of contamination that may impact the Portland Harbor Superfund Site consistent with the JSCS. The JSCS is a guidance document that represents a framework to identify, prioritize, and implement source control measures at upland sites within the Portland Harbor Superfund Site.

Between 2015 and 2017, Univar Solutions completed a Stormwater Source Control Evaluation (SWSCE) (ERM 2017) under ODEQ oversight using ODEQ’s *Guidance for Evaluating the Stormwater Pathway at Upland Sites* (ODEQ 2010). SWSCE activities were performed in accordance with the SWSCE Work Plan (ERM 2015) and the JSCS.

As part of the SWSCE Work Plan, catch basin solids were collected from six catch basins and one trench drain in December 2015 (Figure 2 and Appendix A). The analytical results of catch basin solids sampling were screened against applicable JSCS screening level values (SLVs) promulgated at that time. COIs with one or more exceedance were carried forward into the stormwater discharge sampling program. A weight-of-evidence evaluation was performed with the catch basin solids and stormwater results to determine if more aggressive stormwater investigation and/or source control was needed. Based on these conclusions from the SWSCE, Univar Solutions prepared the SWSCM Work Plan to identify potential contaminant sources and implement targeted SWSCMs, if necessary, for select COIs.

The remainder of this report documents the source tracing activities for select COIs, the implementation of best management practices (BMPs) and SWSCMs, an updated weight-of-evidence evaluation, and provides recommendations in accordance with the SWSCM Work Plan.

1.2 Joint Source Control Strategy

Stormwater runoff has the potential to transport contaminants from the Property to the Willamette River. Stormwater conveyances on the Property connect to City of Portland (COP)-owned stormwater lines that eventually discharge to the Willamette River, nearly 0.5 mile away.

To evaluate and control potential adverse impacts to the Willamette River from industrial properties throughout Portland, the ODEQ and USEPA developed and jointly administer the Portland Harbor JSCS (ODEQ and USEPA 2005). Individual upland property owners are required to identify, evaluate, and control sources of contamination that may reach the Willamette River consistent with the JSCS. The

JSCS is a guidance document that represents a framework to identify, prioritize, and implement SWSCMs at upland sites within the Portland Harbor Superfund Site.

The JSCS outlines the following process for performing SWSCEs:

- **Step 1 – Develop Background Information**. This information is used to provide the framework for selecting catch basin solids and stormwater monitoring parameters for the screening evaluation.
- **Step 2 – Select Sample Analyses Parameters**. This involves selecting parameters for monitoring catch basin solids and stormwater quality and locations for characterizing the stormwater pathways.
- **Step 3 – Design and Perform Catch Basin Solids Sampling**. Catch basin solids represent a time-integrated snapshot of potential solids discharged to the river. During this task, catch basin locations are selected, solids are sampled, and the samples are analyzed for the parameters selected in Step 2.
- **Step 4 – Design and Perform Stormwater Sampling**. Following catch basin solids sampling, stormwater grab sampling is performed; this may include a combination of “first flush” grab sampling and composite sampling throughout the duration of a storm.
- **Step 5 – Perform Screening Evaluation**. Catch basin solids, stormwater, and groundwater infiltration sample results are compared against SLVs that are provided as cleanup levels (CULs) in the Portland Harbor Record of Decision (ROD) dated January 2017 (USEPA 2017). Sample results are compared to JSCS SLVs for parameters that are not assigned CULs in the Portland Harbor ROD. If site concentrations exceed SLVs and readily available best BMPs are not effective at reducing concentrations below SLVs, a qualitative or quantitative weight-of-evidence evaluation is performed to determine if more aggressive stormwater investigation and/or source control is needed.
- **Step 6 – Implement Interim Remedial Measures (if necessary)**. If deemed necessary by the weight-of-evidence evaluation, remedial measures such as source removal, storm system improvements (e.g., line cleaning and catch basin replacement), or stormwater treatment may be implemented.

The SWSCE Work Plan was implemented to address Steps 1, 2, 3, and 4. The SWSCE was completed to address Step 5, and concluded that Step 6 was necessary. The SWSCM Work Plan was developed to identify measures to address the requirements of Step 6. This SWSCEE Report documents completion of those measures and presents an updated weight-of-evidence evaluation.

1.3 Upland Stormwater Strategy

In addition to the JSCS, this SWSCEE Report is intended to incorporate the most current upland source control strategy, as agreed by the USEPA, ODEQ, and COP, and documented in the Portland Harbor Stormwater Strategy Update – Status of Recontamination Prevention dated March 2020 (ODEQ 2020). Elements of the comprehensive Portland Harbor stormwater strategy, as agreed among the USEPA, ODEQ, and COP, include:

- Control of upland legacy stormwater contaminant sources—by implementing the JSCS and ODEQ cleanup program authorities to remediate more than 150 sites within the Portland Harbor drainage boundaries, specifically following ODEQ’s Guidance for Evaluating the Stormwater Pathway at Upland Sites;
- Development and implementation of a Portland Harbor-specific National Pollutant Discharge Elimination System (NPDES) stormwater permit—administered by ODEQ’s Water Quality program and the COP as ODEQ’s agent, for ongoing control of stormwater discharges from cleanup sites and/or other industrial sites within Portland Harbor; and,

- A monitoring and management component—to ensure that remediation of legacy sites and ongoing stormwater permit implementation continue to be effective in preventing sediment recontamination, following implementation of USEPA's sediment remedy.

2 STORMWATER SOURCE CONTROL EVALUATION

This section provides a summary of the source control evaluation completed at the Property, which is described in detail in the ODEQ-approved SWSCE (ERM 2017). A property layout map is provided on Figure 2, and a summary of each drainage basin is included in Table 1. The sample locations for catch basin solids and stormwater are detailed on Figure 3 and Figure 4, respectively. Sample analytical result tables from the SWSCE are included as Appendix A.

2.1 SWSCE Conclusions

Catch basin solids were collected from at least one catch basin (CB) within each drainage basin (CB-1G, CB-2E, CB-3C and CB-3D, CB-4A, CB-5A, CB-6A, and Trench-1) in December 2015. The catch basin solids sampling results were screened against applicable JSCS SLVs at the time. COIs with one or more exceedance were carried forward into the stormwater discharge sampling program. Catch basin solids sampling results presented in the SWSCE were screened against the updated applicable Portland Harbor ROD CULs for riverbank soils / sediment and JSCS SLVs for parameters without Portland Harbor CULs.

Stormwater discharge samples were collected in November 2016 and March, May, and June 2017. During each sampling event, stormwater grab samples were collected from stormwater discharge locations within each drainage basin including catch basins (CB-1G, CB-2E, CB-3D, CB-4A, CB-5A, and CB-6A), Spill Prevention Control and Countermeasure (SPCC) control valves (E-1 and W-4), a manhole with combined stormwater (STM-1), and a trench drain (Trench-1). The stormwater discharge results were screened against applicable SLVs (i.e., Portland Harbor ROD CULs for surface water and JSCS SLVs for parameters without Portland Harbor ROD CULs). COIs with one or more SLV exceedances were carried through into a weight-of-evidence evaluation.

A groundwater infiltration sample was collected in June 2017 from the City-owned manhole AAT564. The groundwater infiltration results were screened against applicable SLVs (i.e., Portland Harbor ROD CULs for groundwater and JSCS SLVs for parameters without Portland Harbor ROD CULs). COIs with one or more SLV exceedances were carried through into a weight-of-evidence evaluation.

The qualitative weight-of-evidence evaluation consisted of an assessment of the number and magnitude of SLV exceedances, the overall contaminant loading to the Portland Harbor Study Area, a comparison to other regional industrial sites, and published stormwater criteria. Results of the weight-of-evidence evaluation are detailed in Table 2 and are summarized as follows:

- Chromium, copper, manganese, mercury, nickel, organochlorine pesticides, and PAHs were evaluated for potential sources and based on the comparative evaluation of SLVs, do not have the potential for recontamination or pose unacceptable risk to in-water receptors at Portland Harbor, and therefore SWSCMs were not warranted.
- Source tracing and SWSCMs were recommended for zinc in drainage basins (DB) DB-1, DB-3, and DB-4.
- Source tracing was recommended for arsenic, cadmium, and lead for facility areas that drain to catch basins where the most frequent and significant exceedances of stormwater and solids were observed (CB-4A, Trench-1, and W-4).
- Source tracing was recommended for bis(2-ethylhexyl) phthalate (BEHP) in DB-1, DB-3, and DB-4.
- Source tracing was recommended for polychlorinated biphenyls (PCBs) in DB-1 and DB-3 to investigate Aroclor 1268 detected in trench drain (i.e., Trench-1) solids.

- Groundwater infiltration into the stormwater system has a low potential for recontamination to sediment and unacceptable risk to in-water receptors and can be controlled by ongoing RCRA cleanup activities.

Based on the conclusions provided in the SWSCE, contaminant-specific source tracing activities and SWSCMs were not warranted for DB- 2, DB-5, and DB-6. However, per communications with USEPA during a conference call on 27 March 2018, and as detailed in the Response to USEPA Comments on the Draft SWSCM Work Plan dated 9 April 2018, these drainage basins were included in source tracing and performance monitoring in the SWSCM Work Plan for select COIs as detailed in Table 3 (ERM 2018).

2.2 Source Control Measure Work Plan

The SWSCM Work Plan was developed to identify a phased approach for identifying potential contaminant sources, implementing SWSCMs, conducting performance monitoring, and completing a subsequent effectiveness evaluation. The elements of the SWSCM Work Plan are summarized below:

- Conduct a drainage basin survey to identify potential sources to locations identified in the SWSCE and confirm source tracing sample locations (Table 3).
- Conduct targeted stormwater solids sampling and surface wipe sampling for source tracing (Table 3).
- Evaluate BMPs and proposed SWSCMs based on source tracing results.
- Implement BMPs and proposed SWSCMs.
- Conduct performance monitoring (Table 3).
- Complete an effectiveness evaluation.

Location descriptions are presented in Table 4. The remainder of this report documents the activities completed in accordance with the USEPA-approved SWSCM Work Plan.

3 SOURCE TRACING

ERM completed source tracing to investigate potential sources that may be contributing to the presence of the select COIs (metals [arsenic, cadmium, lead, and zinc], Aroclor 1268, BEHP, and total suspended solids [TSS]) in catch basin solids and/or stormwater samples at the Property as identified in the SWSCM Work Plan.

Based on communications with USEPA, ERM added select volatile organic compounds (VOCs) to the list of parameters requiring source tracing following completion of the final performance monitoring event (see Section 3.2.4). Laboratory results from this event indicated that tetrachloroethene (PCE) and trichloroethene (TCE), were detected at monitoring point STM-1 in DB-1 at higher concentrations (i.e., between a factor of 1 and 10 times higher) compared to previous monitoring results. Following receipt of these laboratory results, Univar Solutions determined that additional source tracing for these VOCs (PCE and TCE) was required prior to completing the SWSCEE.

The source tracing activities included:

- A drainage basin survey to identify potential sources of COIs; and
- Targeted sampling of stormwater solids, surface wipes, and stormwater to assess the presence of COIs in potential sources identified in the drainage basin survey.

3.1 Drainage Basin Survey

ERM conducted a drainage basin area survey at the Property in accordance with the SWSCM Work Plan on 16 October 2018 (Figure 2). ERM completed an additional drainage basin survey for VOCs in DB-1 between 11 December 2020 and 18 February 2021. The purpose of the drainage basin surveys was to evaluate operations, equipment, and building materials at the Property that may be contributing to COIs in catch basin solids and stormwater discharge.

Potential sources of metals (arsenic, cadmium, lead, and zinc), Aroclor 1268, BEHP, TSS, and VOCs identified in each of the drainage basins are detailed in Table 5 and summarized below. A photograph log detailing the basin surveys and potential sources identified for source tracing samples within these areas is included as Appendix B.

3.1.1 Arsenic

In the SWSCM Work Plan, arsenic was identified as a COI requiring source tracing to verify that potential source(s) of arsenic in DB-3 (i.e., contributing to Trench-1) continue to be controlled (Table 2). As requested by USEPA, potential sources of this COI were also reviewed in each of the drainage basins at the Property during the drainage basin survey.

ERM observed potential sources of arsenic at the Property to include pallet jack batteries, IBC tote galvanized metal, galvanized metal siding, treated wood panels, paint/sealant on concrete, and exposed soil (i.e., naturally occurring; ODEQ 2013). ERM identified these potential sources for wipe sampling and/or solids sampling at select locations within DB-1, DB-3, and DB-4 based on survey observations and previous arsenic detections within these drainage areas (Table 5; Appendix B).

3.1.2 Cadmium

In the SWSCM Work Plan, cadmium was identified as a COI requiring source tracing to verify that potential sources of cadmium in DB-3 (i.e., contributing to Trench-1) and DB-4 (i.e., contributing to CB-4A) continue to be controlled (Table 2). As requested by the USEPA, potential sources of this COI were also reviewed in each of the drainage basins at the Property during the drainage basin survey.

ERM observed potential sources of cadmium at the Property to include pallet jack batteries, IBC tote galvanized metal, galvanized metal siding/roof, treated wood panels, paint/sealant on concrete, truck traffic (tire wear and brake pad dust), and exposed soil (i.e., naturally occurring; ODEQ 2013). ERM identified locations for wipe sampling and/or solids sampling on the potential source materials in DB-3 and DB-4 based on survey observations and previous cadmium detections within these drainage areas (Table 5; Appendix B).

3.1.3 Lead

In the SWSCM Work Plan, lead was identified as a COI requiring source tracing to verify that potential sources of lead in DB-1 (e.g., contributing to W-4) and DB-3 (e.g., contributing to Trench-1) continue to be controlled. As requested by the USEPA, potential sources of this COI were also reviewed in each of the drainage basins at the Property during the drainage basin survey.

ERM observed potential sources of lead at the Property to include pallet jack batteries, IBC tote galvanized metal, galvanized metal siding/roof, treated wood panels, paint/sealant on concrete and exposed soil, and truck traffic (motor oil, tire wear, and brake pad dust). ERM identified locations for wipe sampling and/or solids sampling on the potential source materials in DB-1, DB-3, and DB-4 based on survey observations and previous lead detections within these drainage areas (Table 5; Appendix B).

3.1.4 Zinc

In the SWSCM Work Plan, zinc was identified as a COI requiring source tracing to verify that potential sources of zinc in DB-1 (e.g., contributing to W-4), DB-3 (e.g., contributing to Trench-1), and DB-4 (e.g., contributing to CB-4a) continue to be controlled (Table 2). As requested by the USEPA, potential sources of this COI were also reviewed in each of the drainage basins at the Property during the drainage basin survey.

ERM observed potential sources of zinc at the Property to include pallet jack batteries, IBC tote galvanized metal, galvanized metal siding/roof, treated wood panels, paint/sealant on concrete and exposed soil, and truck traffic (motor oil, tire wear, and brake pad dust). ERM identified locations for wipe sampling on the potential source materials in DB-1, DB-3, and DB-4, and stormwater solids in DB-4 based on survey observations and previous zinc detections within these drainage areas (Table 5; Appendix B).

3.1.5 Bis(2-ethylhexyl) phthalate

In the SWSCM Work Plan, BEHP was identified as a COI requiring source tracing due to the magnitude of BEHP detected in catch basin solids in DB-1 (e.g., in CB-1G), DB-3 (e.g., in Trench-1), and DB-4 (e.g., in CB-4A) continue to be controlled (Table 2). As requested by the USEPA, potential sources of this COI were also reviewed in each of the drainage basins at the Property during the drainage basin survey.

ERM observed potential sources of BEHP at the Property to include storage materials (e.g., plastic 55-gallon drums, IBC totes, plastic pallet wrap), truck traffic (tire wear and brake pad dust), and exposed soil. ERM identified locations for wipe sampling on the potential source materials in DB-1 and stormwater solids in DB-4 based on survey observations and previous BEHP detections within these drainage areas (Table 5; Appendix B).

3.1.6 Polychlorinated Biphenyls

In the SWSCM Work Plan, Aroclor 1268 was identified as a COI requiring source tracing due to the sole detection of Aroclor 1268 in catch basin solids in DB-3 (i.e., in Trench-1; Table 2). As requested by USEPA, potential sources of this COI were also reviewed in each of the drainage basins at the Property during the drainage basin survey.

As Aroclor 1268 was the only PCB Aroclor detected by the SWSCE, ERM identified building materials that could be potential sources of Aroclor 1268; these building materials included treated wood columns, Paint and Cotton shed siding on walls, paint/sealant on concrete, and window glaze. ERM identified locations for wipe sampling, solids sampling, and/or material sampling of building materials that are potential sources of Aroclor 1268 in DB-3 and DB-4 based on survey observations and previous detections of Aroclor 1268 within these drainage areas (Table 5; Appendix B).

3.1.7 VOCs

In the SWSCM Work Plan, VOCs were not identified as a COI requiring source tracing (Table 2); however, select VOCs (i.e., PCE and TCE) were determined to require source tracing due to performance monitoring results in DB-1 (i.e., contributing to STM-1). In response to these performance monitoring results, ERM completed drainage basin surveys within DB-1 to review potential sources of these VOCs in stormwater.

ERM reviewed operations at the Property and verified that no new activities, handling, incidents, or releases have occurred regarding VOCs. However, soil disturbance activities were conducted in late 2019 and early 2020 within DB-1 to install footings for fall protection infrastructure. These activities were conducted in an area of historical VOC impacts to shallow soil. While BMPs were implemented during these activities (i.e., catch basin protection and sweeping following completion), they were conducted in the vicinity of stormwater infrastructure and had the potential to impact stormwater runoff. Additionally, soil was stored for disposal in a roll-off bin within DB-1. ERM identified locations for stormwater source tracing from STM-1 and upgradient sample locations (CB-1B, CB-1C, CB-1J, and W-4) to evaluate potential sources and the reproducibility of VOC observations at STM-1 (Table 5; Figure 5).

3.2 Source Tracing Samples

Based on the results of the drainage basin surveys (Table 5) and in accordance with the SWSCM Work Plan, ERM selected locations for collecting stormwater solids samples (i.e., upgradient of catch basins), surface wipe samples, material samples, and additional stormwater source tracing samples in DB-1, DB-3, and DB-4. The intent of source tracing samples is to inform evaluation of BMPs and SWSCMs.

Note that although some potential source materials were identified in multiple drainage areas, ERM collected source tracing samples where catch basin solids or stormwater sampling indicated the need for source tracing (Table 2, Table 5). However, results from source tracing were used to inform stormwater management in each appropriate drainage basin at the Property.

3.2.1 Stormwater Solids Sampling

In the SWSCM Work Plan, stormwater solids sampling was considered at three locations:

- In the dock area upgradient of the SPCC control valve location W-4 (DB-1-Source Solids)
- In the trench drain location Trench-1 (DB-3-Source Solids)
- In the vicinity of catch basin CB-4A (DB-4-Source Solids) (Figure 3)

During the drainage basin survey, the locations adjacent to W-4 and Trench-1 did not contain enough solids to collect samples. Solid samples were collected in the vicinity of catch basin CB-4A from an area of deteriorated pavement where soil was exposed (see Appendix B Photograph Log).

Laboratory results were compared to the CULs for Portland Harbor ROD CUL for Riverbank Soil/Sediment for comparison purposes (Table 6); however, these CULs are not directly applicable to the sample location. Each of the metals analyzed were at concentrations slightly below the CULs. Total PCBs (i.e., only Aroclor 1268 detected) and BEHP were detected at concentrations above the CULs. These results indicate that deteriorated pavement and exposed soil upgradient of CB-4A is a potential source of metals, and BEHP in stormwater and stormwater solids at this location. Aroclor 1268 are potentially associated with historical use in building materials.

3.2.2 Wipe Sampling

Surface wipe samples were collected to determine if building and facility materials identified during the drainage basin survey are contributing to COI concentrations observed DB-1 (i.e., contributing to W-4), DB-3 (i.e., contributing to Trench-1), and DB-4 (i.e., contributing to CB-4A). (Figure 6). A photograph log detailing the wipe sample locations is included as Appendix B. Laboratory results for wipe samples are presented in Table 7. Notable results from the wipe sampling are summarized as follows:

- Arsenic was detected at 1,370 micrograms (µg)/sample in a treated wood panel on the west side of the Cotton Shed (see Appendix B photograph numbers 19 and 20) and at relatively lower concentrations (i.e., ranging from 0.07 to 1.34 µg/sample) at each of the other locations sampled. The treated wood panel on the west side of the Cotton Shed was identified as a source of arsenic in stormwater.
- Cadmium was detected at 1.44 µg/sample in the patches of paint and/or sealant on the concrete platform (see Appendix B photograph numbers 21 through 24). Other locations had less than 0.37 µg/sample. The patches of paint and/or sealant on the concrete platform by the northwest corner of the Paint Shed were identified as a source of cadmium in stormwater.

- Lead was detected at 834 µg/sample in the patches of paint and/or sealant on the concrete platform (see Appendix B photograph numbers 21 through 24). Other locations were relatively lower, ranging from 0.38 to 92 µg/sample. The patches of paint and/or sealant on the concrete platform by the northwest corner of the Paint Shed were identified as a source of lead in stormwater.
- Zinc was detected at concentrations ranging from 1,030 to 1,760 µg/sample in wipe samples collected from galvanized metal surfaces (see Appendix B photograph numbers 25, 26, 31, and 32) and at relatively lower concentrations (i.e., ranging from 134 to 262 µg/sample) at each of the other locations sampled (i.e., patches of paint and/or sealant on the concrete platform details in Appendix B photograph numbers 21 through 24). Galvanized metal surfaces are identified as a source of zinc in stormwater.
- Aroclor 1268 was detected at a concentration of 1,200 µg/sample in the wipe sample collected from the Paint Shed siding in DB-1 (no other PCB Aroclors were detected). Aroclor 1268 was not detected in any of the other source material samples including the treated wood in DB-1 (Appendix B, photograph 13 and 14), the floor paint/sealant in DB-3 (Appendix B, photographs 21 through 24) and window glaze in DB-3. The Paint Shed wall siding material was identified as the potential source of Aroclor 1268 in stormwater and catch basin solids (see Appendix B photograph numbers 15 and 16). Due to the detection of Aroclor 1268 in the wipe sample, ERM recommended collecting samples of the Paint Shed siding material to confirm the wipe sample results and to profile the material for disposal.

3.2.3 Material Samples

ERM collected material samples of the Paint Shed siding on 27 November 2019. Due to the similarity in material composition, ERM also collected samples of siding from the south side of the adjacent Cotton Shed during the same sampling event. ERM removed approximately 1-inch squares of siding from the inner and outer siding surface on the Paint Shed’s east wall and the outer siding surface of the Cotton Shed’s south wall using wet methods (i.e., lightly spraying surface with deionized water before sampling to prevent creation of airborne particles) (Figure 6). Field staff placed duct tape over areas where siding was removed (i.e., sample locations) to prevent potentially friable material from breaking loose.

Aroclor 1268 was detected in each of the samples above the Toxic Substances Control Act limit of 50 parts per million (Table 8). There were no other PCB Aroclors detected in the samples. These results were used to inform the extent of the siding removal and disposal process as documented in the *Removal of Building Materials Containing PCBs* report dated 29 September 2020 (ERM 2020a; See Appendix C).

3.2.4 Stormwater Source Tracing Samples

ERM collected stormwater samples from STM-1 and upgradient sample locations (CB-1B, CB-1C, CB-1J, and W-4) for source tracing on 11 December 2020 and 18 February 2021. The stormwater source tracing samples were collected based on observations from the drainage basin surveys and email communications with the USEPA. ERM used sampling methodology consistent with the SWSCM Work Plan as detailed in Section 5.1 of this SWSCEE Report. Laboratory results for stormwater source tracing are presented on Figure 5. Notable results are summarized as follows:

- VOCs are still elevated at STM-1, although lower than observed in November 2020 (i.e., PCE concentration reduced from 26 to 7.5 µg/L and TCE concentration reduced from 27 to 7.9 µg/L).
- VOCs detected at each of the upgradient sample locations were similar to or below concentrations historically observed at STM-1 (i.e., PCE and TCE ranged from non-detect to 0.52 µg/L).

Based on source tracing activities conducted for VOCs in DB-1, shallow soil with historical VOC impacts (Figure 5) is a likely source for VOCs in stormwater, if exposed during soil disturbance activities (PES 2011).

4 SOURCE CONTROL MEASURES

The following sections provide a description of SWSCMs implemented at the Property during completion of the SWSCM Work Plan.

4.1 Ongoing Stormwater Management Measures

Stormwater management measures are implemented at the Property as described in the January 2020 Stormwater Pollution Control Plan (ERM 2020b). Below is a summary of the controls and BMPs that are currently in place to prevent and minimize the potential for COIs to enter the stormwater system.

- Catch Basin Solids Control
- Spill Prevention and Response
- Waste Chemicals and Materials Disposal
- Stormwater Containment and Diversion

Source tracing activities described in Section 3.2 were used to evaluate and modify select ongoing stormwater management measures implemented at the Property as described below.

4.1.1 Housekeeping Measures

Sweeping of paved areas was increased from semi-annually to quarterly. The increased sweeping schedule is expected to provide further reduction of zinc concentrations and those COIs (i.e., metals, BEHP, Aroclor 1268) which may potentially be associated with stormwater solids.

4.1.2 Waste Chemicals and Material Disposal

Univar Solutions contains and manages waste chemicals in accordance with applicable federal and state regulations.

General facility garbage waste is collected in roll-off bins at the south west side of DB-3. Garbage is removed 1-2 times per week, as required. General facility recycling is collected in covered bins at the south side of DB-2. Scrap metal is covered and stored in the Drainage Area 4B material storage area. Recycling and scrap metal are removed as required.

4.1.3 Catch Basin Solids Control

Standard “Lynch-style” catch basins equipped with inverted elbows and grate covers are used on the Property to trap solids and debris in stormwater runoff. The catch basins allow solids and debris to settle to the bottom of the basin, while the inverted elbow allows stormwater to flow to the stormwater system. Catch basins are cleaned by removing catch basin inserts, vacuuming out water and solids, and replacing the catch basin inserts on approximately an annual basis at minimum.

In addition to catch basin design and annual cleanouts, select ongoing catch basin solids controls were modified throughout completion of the SWSCM Work Plan:

- In 2019, catch basin filter fabric inserts were installed in DB-1, DB-2, DB-3, DB-4, and DB-5 to minimize sediment load and associated COIs (i.e., metals, BEHP, Aroclor 1268) to the stormwater system. Catch basin inserts are inspected monthly and replaced at a minimum during the annual catch basin cleanouts.

Each of these measures are effective at reducing TSS in stormwater runoff, which has a direct effect on reduction of stormwater contaminants (e.g., metals, phthalate esters, polycyclic aromatic hydrocarbons [PAHs], and PCBs) that are typically associated with TSS.

4.1.4 Spill Prevention and Response

Univar Solution's spill prevention and control (SPCC) measures are intended to prepare for, prevent, control, and respond to spills/releases. These SPCC measures include shut-off valves associated with the Property's stormwater piping in potential spill areas. There are 11 SPCC control valves on the Property to prevent releases of hazardous substances to the Property's catch basins: five on the west side and six on the east side, respectively (Figure 4). The SPCC control valves contain manually activated shut-off valves that can be closed in the event of a spill within the drainage areas serviced by these devices, thereby ensuring that spilled materials are contained on the Property.

The Operations Manager is the primary person accountable for spill prevention. The Operations Manager is stationed at the Property and has the authority to commit all resources and personnel necessary for spill prevention and control at the Property. Additional details describing the spill prevention measures and procedures are outline in the Stormwater Pollution Control Plan (ERM 2020b).

4.1.5 Stormwater Containment and Diversion

Chemicals are stored and handled in covered dry package and covered drum storage areas (as shown on Figure 2) on pallets or in IBCs as appropriate. In other areas of the Property where operational activities occur, chemical products are stored on elevated wood pallets or specialized chemical pallets. Stormwater is managed through the use of curbs, roof drains, floor drains, and catch basins appropriately and strategically located within drainage areas to capture runoff and divert flow to underground storm drains.

In addition to general secondary containment areas, the Property has two specific secondary containment areas associated with the solvent tank farm and the corrosive tank farm. The tank farms' secondary containment areas have no drains or outlets. When stormwater accumulates in the solvent tank farm's secondary containment area, it is visually inspected for sheen. If there are no visual indicators of product releases in the stormwater, the stormwater is pumped to DB-1 for discharge to the Property's stormwater system. If the stormwater has a visual sheen, it is pumped to barrels or tanker trucks to be transported off the Property to a wastewater treatment plant. Stormwater accumulations in the corrosive tank farm's secondary containment areas are visually inspected, transferred to a neutralization tank, tested for pH, and neutralized as necessary before being discharged to the sanitary sewer under an Industrial Wastewater Discharge Permit (No. 400.025).

4.2 Source Control Measures

Univar Solutions implemented and expanded BMPs (Figure 7) and SWSCMs (Figure 8) according to identified sources of COIs during source tracing activities. The following sections summarize both existing and additional source control measures (i.e., according to source tracing activities) implemented at the Property.

4.2.1 Pavement Curbing

Curbing on the east side of the Property was identified as a BMP to minimize mixing of stormwater from the adjacent Container Recovery, Inc. (ESCI #4015) site at 3900 NW Yeon Avenue. Univar Solutions installed concrete curbing installed to a height of 6 inches along the property line, where necessary, to prevent potential run-on of stormwater from the adjacent site (Figure 7). This work was completed in 2018.

4.2.2 Repaving

Due to years of heavy truck traffic and natural weathering, asphalt pavement on the western portion of the Property is degrading. Portions of the Property have already undergone capital improvements, to include repaving (e.g., the east side drive, the new truck scale in the southwest, and a new fire line east and south of the loading dock area). Additional new paving was completed during completion of the SWSCM Work Plan (Figure 7):

- On the west side of the property in the rail car siding vicinity in fall 2017; and
- On the south end of the property in fall 2019 (Figure 7).

Univar Solutions conducts paving repairs on an as-needed basis and is currently evaluating the need for repaving the remainder of paving on the west side of the Property.

According to source tracing activities (see Section 3.2.1), deteriorated pavement and exposed soil upgradient of CB-4A (southwest of the loading dock area in DB-4) is a potential source of metals, and BEHP in stormwater and stormwater solids at this location. Univar Solutions is currently repaving the degraded asphalt in this area (April and May 2021) to reduce the potential for solids to wash into the stormwater system and improve the efficiency of the street sweeping. In the interim, sorbent booms and filtration media (see Sections 4.2.4 and 4.2.5) have been placed around catch basin CB-4A to minimize the impact of COIs associated with solids from deteriorating pavement.

4.2.3 Solids Filtration at Trench-1

In response to the catch basin solids and stormwater monitoring results documented in the SWSCE, Univar Solutions installed a solids filter in Trench-1 to reduce TSS in December 2018. The solids filter device in Trench-1 contains four layers of thermo-polypropylene-based filter material with progressively smaller pore spaces that target solids particles (Figure 7).

This filter is expected to have a direct effect on reducing concentrations of metals, phthalate esters (e.g., BEHP), PAHs, and Aroclor 1268 in stormwater as these COIs corresponded with the samples with the highest TSS concentrations.

4.2.4 Catch Basin Filter Media

Univar Solutions installed filtration media (i.e., Metalzorb, and/or NOC Socks with peat and zeolites) to evaluate metals removal at select catch basins and stormwater piping locations within DB-1, DB-2, DB-3, DB-4, and DB-5 in May 2020 and December 2020. Media was installed either by placing adsorption socks within catch basins or direct in stormwater conveyance piping (i.e., with Metalzorb) or by placing adsorption booms around catch basins (i.e., NOC Socks with peat and zeolites). ERM completed stormwater system monitoring following installation of filtration media to evaluate effectiveness, and determined expected locations suitable for ongoing use of these media (see Figure 7). Filtration media characteristics are detailed in specification sheets provided in Appendix D.

The use of filtration media is expected to be effective for reducing concentrations of metals in stormwater and will be managed through ongoing stormwater management at the Property (see Section 4.3).

4.2.5 Metal Exposure Reduction

ERM observed exposed metal equipment (e.g., old forklifts) and scrap metal (e.g., piping, angle iron, etc.) in DB-4 during the drainage basin survey. These materials are a potential source of metals in stormwater and were removed or covered in 2020 and 2021 (see Figure 8). Newly generated scrap metal is stored in a covered roll-off bin until it is disposed. Additionally, storage of IBC totes with the galvanized metal was rearranged in early 2021 to minimize rainfall contact.

Reduction of metals exposure to stormwater is expected to have a direct effect on reduction of metals concentrations in stormwater.

4.2.6 PCB Siding Removal

According to wipe sampling and material sampling results of the Paint Shed and Cotton Shed siding, Univar Solutions identified the need to complete removal and disposal of these building materials as a source control measure in DB-1, DB-2, and DB-3 for building materials containing Aroclor 1268.

From 30 January through 25 March 2020, U.S. Ecology, Inc. (Ecology) contractor of Boise, Idaho (i.e., contractor to Univar Solutions) completed removal and disposal of PCB Aroclor 1268 containing building materials in accordance with applicable state and federal regulations. The areas of siding removal are shown on Figure 8.

The siding containing Aroclor 1268 on the Paint Shed and Cotton Shed were removed, the surrounding area was appropriately protected (i.e., poly sheeting) during the removal process, removal was performed using techniques known to not create airborne particles, and stormwater conveyance structures in the impacted area were protected (i.e., covered with poly sheeting). After removal, the siding was double-wrapped, sealed in 6-millimeter poly sheeting, and labeled per federal abatement regulations before being placed into a 20-yard roll-off bin.

Ecology (USEPA Identification No. CAR000030114) stored the siding waste that was generated from the removal activities in a lined roll-off bin on the property and transported it to Ecology landfill (USEPA Identification No. IDD073114654) located in Grandview, Idaho, where it was received on 25 March 2020. The siding waste was ultimately disposed of on 25 March 2020.

These activities are documented in full detail in the *Removal of Building Materials Containing PCBs* report dated 29 September 2020 (ERM 2020a; See Appendix C).

4.2.7 Stormwater Line Jetting (Post Siding Removal)

From 28 August through 4 September 2020, NRC/US Ecology, contractor to Univar Solutions, hydro-jetted the stormwater lines and catch basins surrounding the siding removal work area to address potential residual solids in the Univar Solutions-owned stormwater conveyance system (Figure 8).

A vacuum truck was stationed at a point on the stormwater line downgradient of the jetting location to capture/extract the jetting water generated from these activities. Lines were blocked off with pillow or spill prevention, control, and countermeasure valves to prevent wastewater from making it past the extraction point. Captured line jetting water was properly disposed of offsite; manifests for disposal are include in Appendix C.

4.2.8 Contaminated Media Management Plan

Historical VOC impacts to shallow soil are identified as a potential source to VOCs in stormwater if exposed during construction activities (i.e., the Property is paved with asphalt and concrete). Univar Solutions is developing a Contaminated Media Management Plan (CMMP) to mitigate potential impacts to stormwater.

The CMMP will provide site-specific information for workers regarding the management of contaminated media that could be encountered during construction activities. This includes any measures that should be taken to control exposure to workers during construction activities and measures to prevent off-site migration of contaminated soil via erosion (i.e., stormwater runoff) or track-off.

4.3 Ongoing Stormwater Management

ODEQ renewed the NPDES Industrial Stormwater General 1200-Z Permit (the “1200-Z Permit”) with an effective date of 1 August 2017 and requested Univar Solutions obtain coverage under the permit due to the Property’s location within the Portland Harbor drainage. The Property obtained coverage under the 1200-Z Permit on 18 July 2019.

Stormwater monitoring required under the 1200-Z Permit consists of four events per year with a specific list of analytes that include NPDES benchmark parameters for metals (i.e., copper, lead, and zinc) and water quality (i.e., pH and TSS). This suite of analytes includes the COIs used in this SWSCEE. This stormwater monitoring will evaluate the effectiveness of the BMPs discussed above (e.g., catch basin solids control, filtration media, and metals exposure reduction) as part of maintaining this Permit.

5 PERFORMANCE MONITORING

This section describes the sample analytical parameters and activities completed to evaluate stormwater concentrations after implementing SWSCMs. Stormwater sampling for performance monitoring included grab sampling during three storm events from winter 2019 to fall 2020.

5.1 Sample Methodology

5.1.1 Sample Locations

ERM collected stormwater samples from locations representing each drainage basin on the Property for targeted, location-specific SWSCM implementation and subsequent effectiveness monitoring of contaminants (Table 1, Table 4, and Figure 9).

Four catch basins (CB-2E, CB-4A, CB-5A, and CB-6A), one SPCC control valve (E-1), and one manhole (STM-1) at the Property were selected for stormwater grab sampling for performance monitoring of SWSCMs based on the following general criteria:

- Representative of potential sources to the locations identified as requiring source tracing measures;
- Representative of combined runoff from each drainage basin at the Property including those identified as requiring SWSCMs (i.e., E-1, STM-1, and CB-4A); and
- Locations that were included in the previous stormwater characterization program in the SWSCE such that previous samples may provide a baseline.

5.1.2 Storm Event Criteria

Univar Solutions conducted the stormwater sampling described in the SWSCM Work Plan (ERM 2018) when storm events were anticipated to meet the following criteria (from Appendix E of the JSCS):

- Antecedent dry period of at least 24 hours (as defined by less than 0.1 inch over the previous 24 hours);
- Minimum predicted rainfall volume of greater than 0.2 inch per event; and
- Expected duration of storm event of at least 3 hours.

The COP HYDRA network rain gauge at 3395 NW Yeon Street (https://or.water.usgs.gov/non-usgs/bes/yeon.html) was used to evaluate the antecedent dry period criteria and target storm event rainfall distribution and totals. Additional information was obtained from the National Weather Service Forecast Weather Table Interface for Portland, Oregon, available at: (http://www.wrh.noaa.gov/forecast/wxtables/ index.php?wfo=pqr).

5.1.3 Sample Collection

ERM collected stormwater samples in general accordance with methodology presented within the SWSCM Work Plan during storm events in February 2019, March 2020, and September 2020. Each of the storm events sampled met the criteria for antecedent dry period of at least 24 hours, rainfall volume of greater than 0.2 inch, and storm event duration of at least 3 hours.

For safety and efficiency, ERM transitioned to using a peristaltic pump at all sample locations for grab sample collection. New tubing was used at each location to prevent cross-contamination.

Rainfall hydrographs were generated for each storm event using data obtained from the COPs HYDRA rain gauge at 3395 NW Yeon Street (https://or.water.usgs.gov/non-usgs/bes/yeon.html). This rain gauge was selected as the closest available rain gauge to the Property. Rainfall hydrographs for storm events in February 2019, March 2020, and September 2020 are included as Appendix E.

5.1.4 Sample Analysis

Stormwater samples were analyzed for parameters that exceeded the CULs and JSCS SLVs in accordance with results from the SWSCE screening and as identified in the SWSCM Work Plan (Table 2 and Table 3).

The ALS laboratory analyzed each stormwater sample for:

- Metals (arsenic, cadmium, copper, lead, manganese, nickel, and zinc) by USEPA Method 6020 low level
- PCBs by USEPA Method 8082
- VOCs by USEPA Method 8260C low level
- PAHs and phthalates by USEPA Method 8270D or 8270D SIM
- Organochlorine pesticides by USEPA Method 8081B low level
- TSS by USEPA Method 2540D

ERM analyzed stormwater samples for pH in the field following sample collection with a three-point calibrated (i.e., pH 4, pH 7, and pH 10) pH probe.

5.1.5 Deviations from the Work Plan

Calculation of Portland Harbor JSCS parameters DDx (i.e., sum of dichlorodiphenyldichloroethane [DDD], dichlorodiphenyldichloroethylene [DDE], and dichlorodiphenyltrichloroethane [DDT] isomers) and carcinogenic PAHS (cPAHs calculated as benzo(a)pyrene equivalent) was not completed since the approved list of COIs for each of these groups is insufficient for the calculations (Table 3). Discussion of each of these calculated parameters and consideration of potential SLV exceedances is provided in weight of evidence evaluation for organochlorine pesticides and PAHs in Sections 6.2.3 and 6.2.6, respectively.

Additional samples, beyond the original SWSCM Work Plan scope, were collected at STM-1 and select upgradient locations (i.e., CB-1A, CB-1B, CB-1C, CB-1J, and W-4) in December 2020 and February 2021 to investigate elevated PCE and TCE results (i.e., order of magnitude above historical results) observed at that location in September 2020 (Figure 5).

5.2 Data Summary

ERM collected stormwater samples during three storm events on 14 February 2019, 13 March 2020, and 22 September 2020. Additional samples were taken at STM-1 and upgradient catch basins in December 2020 and February 2021 to investigate the elevated PCE and TCE results.

A summary of analytical results screened against the SLVs (i.e., Portland Harbor ROD CULs for surface water and JSCS SLVs for parameters without Portland Harbor ROD CULs) is presented in Table 9. The laboratory analytical report and data validation memorandum are presented in Appendix F.

5.3 Data Interpretation

5.3.1 Method Detection Limits and QA/QC Summary

Analytical data was reviewed to ensure it met the quality assurance and quality control (QA/QC) standards specified in the Quality Assurance Project Plan (QAPP). The laboratory was changed from Test America to ALS to achieve better reporting limits. An electronic version of the ALS QAPP is available upon request. All data from the sampling events were determined to be usable for decision-making purposes; however, the limitations indicated by the applied qualifiers should be considered when using the data. The data validation memoranda describe the details of the data validation and are included as Appendix F.

Method detection limits (MDLs) reported by the laboratory for non-detect results were compared against the target MDLs for stormwater samples in Appendix G. PCBs, select PAHs, and phthalate esters were non-detect with MDLs above those listed in Appendix G in some results. These raised detection limits were attributed to matrix interferences, emulsions forming during laboratory extraction, or dilutions performed by the laboratory. Organochlorine pesticide and benzo(a)pyrene non-detects above SLVs are due to analytical method limitations.

Some of the SLVs (i.e., organochlorine pesticides, benzo(a)anthracene, benzo(a)pyrene, BEHP, and Total PCBs) are below MDLs and do not consider risk-based, site-specific exposure and risk factors. Methods were selected to achieve SLVs; however, in some cases, as noted above, analytical method limitations resulted in MDLs above SLVs.

February 2019 Samples (K1901412)

- The laboratory’s certification for pesticides by Method 8081B has been suspended due to performance testing samples that failed with high recoveries. The lab analyzed these samples for pesticides on 21 and 22 February, which was prior to the certification suspension. All pesticide sample results were non-detect with one exception. 4,4’-DDE was detected in sample CB5ASW20190214 below the method reporting limit (MRL). The result was qualified as estimated (J) because the results on both columns exceeded the column agreement criteria.
- Di-n-butyl phthalate was detected at a concentration less than the MRL in a method blank sample. Associated results within five times the blank concentration and less than the MRL were qualified as non-detect (U) at the MRL.

March 2020 Samples (K2002352)

- The laboratory noted that all vials for the laboratory-supplied trip blank sample contained headspace. The non-detected results for the trip blank were rejected (R) due to the headspace.

- Benz(a)anthracene was detected in a method blank sample at a concentration less than the MRL. Associated sample results with benz(a)anthracene results less than five times the blank concentration and less than the MRL were qualified as non-detect (U) at the MRL.
- The indeno(1,2,3-cd)pyrene results associated with the continuing calibration verification (CCV) analyzed on 19 March 2020 were qualified as estimates with a high bias (J+) due to high CCV recovery.
- PCB surrogate decachlorobiphenyl was recovered below laboratory limits in samples CB-5A_20200313 and CB-6A-SW_20200313. All PCB results in both samples were qualified as estimates (J-/UJ).
- The laboratory noted that the agreement of results between the primary and confirmation columns exceeded 40 percent for heptachlor epoxide in sample STM-1-SW_20200313 and 4,4'-DDE in sample E-1-SW_20200313. The associated results were qualified as estimated (J).

September 2020 Samples (K2008424)

- The laboratory reported two sets of chlordane results for all samples due to chlordane not being spiked in the laboratory control samples from the original batch. The reanalysis batch results were reported out of hold and qualified as estimates (UJ). The reanalysis results were all non-detected, which confirmed the original results. The original results are considered non-preferred since they are missing required quality control samples. These non-preferred results were not reviewed in this validation effort.
- Bis(2-ethylhexyl) phthalate, di-n-butyl phthalate, and hexachlorobenzene were detected in method blank samples at concentrations less than the reporting limit. Associated sample results with results for these analytes within five times the blank concentration and less than the MRL were qualified as non-detect (U) at the MRL.
- Diethyl phthalate and dimethyl phthalate results in project samples associated with high recoveries in laboratory control samples and sample duplicates were qualified as estimates with a high bias (J+).
- The laboratory noted that the agreement of results between the primary and confirmation columns exceeded 40 percent for select pesticides in samples DUP_SW_20200923, CB_5A_SW_20200923, STM-1_SW_20200923, CB-2E_SW_20200923, and E-1_SW_20200923. The associated results were qualified as estimated (J), with the exception of the hexachlorobenzene result for sample CB_5A_SW_20200923, which was qualified (U) at the MRL due to blank contamination.
- Select PAHs results in samples DUP_SW_20200923, CB_5A_SW_20200923, CB-2E_SW_20200923, and E-1_SW-20200923 could not be accurately quantified due to the presence of non-target components. The matrix interference may have resulted in a slight high bias. These data were qualified as estimates with a high bias (J+)

December 2020 Samples (K2011774)

- TCE was detected at a concentration below the MRL in trip blank sample TB-20201211. Trichloroethene results less than five times the blank concentration and less than the MRL were qualified as non-detect (U) at the MRL. TCE results within five times the blank concentration and greater than the MRL were qualified as estimated with a high bias (J+).

February 2021 Samples (K2101542)

- Chloroform, PCE, TCE, and vinyl chloride were detected in the trip blank sample at concentrations below the MRL. Results less than five times the blank concentration and less than the MRL were qualified as non-detect (U) at the MRL.

5.3.2 SLV Exceedances

As part of this SWSCEE, site-specific contaminant concentrations for applicable pathways have been compared to Portland Harbor ROD CULs. SLVs provided in the JSCS guidance document are used for comparison purposes for parameters without Portland Harbor ROD CULs. Throughout this evaluation, Portland Harbor ROD CULs and JSCS SLVs are referred to collectively as “SLVs.”

Many of the SLVs are extremely conservative and not directly applicable to the media being sampled as part of this investigation. For example, stormwater to surface water SLVs are highly conservative since significant dilution of solids and water occurs prior to stormwater reaching a receiving surface waterbody. In other words, human and ecological receptors are not directly exposed to undiluted stormwater for extended periods of time. Many of the SLVs are below analytical reporting limits and do not consider risk-based, site-specific exposure and risk factors. Further, according to the ODEQ Upland Source Control Update (ODEQ 2020), “water column-specific remedial goals are most appropriately applied as measures of progress toward meeting sediment remedial action objectives, rather than non-sediment CULs intended to be met as a result of implementation of the sediment remedy.” Accordingly, an exceedance of an SLV does not necessarily indicate that the upland source of contamination poses an unacceptable risk to human or ecological receptors; it only indicates that further consideration using a weight-of-evidence approach is required. The performance monitoring results summarized relative to SLVs, within this section, have been used to update the weight-of-evidence evaluation presented in the SWSCE (see Section 6.0).

A discussion of the stormwater analytical results relative to monitoring conducted prior to implementation of the SWCM and comparison to the SLVs is provided below for each site-specific contaminant.

5.3.2.1 Metals

Arsenic, copper, lead, and zinc were detected above SLVs for all stormwater sample locations during at least two sample events (Table 9). The number of SLV exceedances for arsenic, copper, lead, and zinc was relatively consistent with the SWSCE sample events; however, the magnitude of exceedances generally decreased (i.e., lower exceedance quotients [EQs]). Cadmium was detected above SLVs for all stormwater discharge sample locations, except CB-05A, during at least one sample event. The number and magnitude of cadmium SLV exceedances decreased relative to the SWSCE sampling. There were no manganese or nickel exceedances (Figures 10 through 16).

5.3.2.2 Polychlorinated Biphenyls

PCBs were not detected in 14 out of 18 samples collected during the 2019/2020 stormwater sampling events; the exception were four samples collected during the second sampling event (13 March 2020) where only Aroclor 1268 was detected (Table 9 and Figure 17). As there is no individual SLV for Aroclor 1268, sample results were conservatively compared to the SLV for Total PCBs. The SLV for Total PCBs was exceeded at CB-2E, CB-5A, E-1, and STM-1 based on the detections of Aroclor 1268 in these samples. A decrease in the number and magnitude of Aroclor 1268 detections in 2019/2020 was observed relative to the SWSCE sample events. As noted, an exceedance of an SLV does not necessarily indicate an unacceptable risk to human or ecological receptors; the comparative SLV conservatively selected was for Total PCBs and not for Aroclor 1268.

5.3.2.3 Organochlorine Pesticides

Organochlorine pesticides were detected above the SLVs in half (i.e., 8 out of 16 samples) of the stormwater samples for at least one analyte (Table 9 and Figure 18).

Most of these organochlorine pesticides detections were qualified as estimated (i.e., greater than the MDL and below the MRL) with the exception of a single detection of each 4,4-DDE and 4,4-DDT at both CB-2E and E-1 in September 2020; 4,4-DDT at CB-4A and STM-1 in September 2020; and heptachlor epoxide at STM-1 in March 2020. The reporting limits for the performance monitoring events were generally an order of magnitude lower than the SWSCE sampling events and resulted in a relative increase in the number of detections.

5.3.2.4 Volatile Organic Compounds

VOCs were generally not detected above SLVs (i.e., 12 out of 18 samples) at stormwater sample locations with the exception of detections of TCE at CB-4A; and PCE and TCE at E-1 and STM-1 (Table 9 and Figure 19). PCE and/or TCE were each detected above the SLVs at E-1 and STM-1 during at least two stormwater sampling events. PCE was detected above the SLV at CB-4A in September 2020 (T.

Results are generally consistent with the SWSCE sampling events (i.e., low number and magnitude of SLV exceedances) with the exception of results for STM-1 in September 2020 (i.e., PCE and TCE detected at an order of magnitude above historical results). Additional samples were collected at STM-1 in December 2020 and February 2021 to investigate the elevated PCE and TCE. The results of this sampling showed consecutive decreases of PCE and TCE results; however, they were still above the SLVs.

5.3.2.5 Phthalate Esters

Butylbenzylphthalate, dibutyl phthalate, diethyl phthalate, dimethyl phthalate, and di-n-octylphthalate were below the SLVs for all events (Table 9). BEHP was detected at concentrations above the SLV at all sample locations, except CB-5A, during at least two sample events (Figure 20). Most of these BEHP detections were qualified as estimated (i.e., greater than the MDL and below the MRL). The reporting limits for the performance monitoring events were generally one to two orders of magnitude lower than the SWSCE sampling events, and resulted in a relative increase in the number of unqualified detections.

5.3.2.6 Polycyclic Aromatic Hydrocarbons

Select PAHs were detected at concentrations above the SLVs at all sample locations, except CB-5A, during at least two sample events (Table 9 and Figure 21). However, most of these PAH detections were qualified as estimated (i.e., greater than the MDL and below the MRL). The reporting limits for the performance monitoring events were generally one to three orders of magnitude lower than the SWSCE sampling events and resulted in a relative increase in the number of unqualified detections.

5.3.2.7 Total Suspended Solids

TSS concentrations decreased relative to the 2016–2017 events. Since there is not an SLV for TSS, a comparison of TSS results to the 1200-Z benchmark (i.e., 30,000 µg/L) indicates that there were fewer benchmark exceedances relative to the 2016–2017 events (i.e., three in 2019–2020 versus twenty in SWSCE). The results are presented in Table 9 and field notes are included as Appendix H.

Observed reductions in TSS concentrations are expected to correspond with reductions in concentrations of metals, phthalate esters (e.g., BEHP), PAHs, and Aroclor 1268 in stormwater.

5.3.3 Discussion

All performance monitoring results were compared to the respective SLVs (i.e., Portland Harbor ROD CULs and JSCS SLVs for parameters without Portland Harbor ROD CULs) in accordance with the JSCS and the SWSCM Work Plan.

All constituents that exceeded the SLVs were carried forward into the weight-of-evidence evaluation. The COI retained for consideration in the weight-of-evidence evaluation include metals (arsenic, cadmium, copper, lead, and zinc); PCBs; organochlorine pesticides; VOCs (PCE and TCE); phthalate esters; and PAHs.

6 WEIGHT-OF-EVIDENCE EVALUATION

The qualitative weight-of-evidence evaluation presented in the SWSCE consisted of an assessment of the number and magnitude of SLV exceedances, the overall contaminant loading to the Portland Harbor Study Area, a comparison to other regional industrial sites, and published stormwater criteria. This section presents an updated weight-of-evidence evaluation for each of the COIs evaluated in the SWSCE that also exceeded the SLVs during performance monitoring.

The purpose of this evaluation is to analyze multiple lines of evidence to evaluate the effectiveness of BMPs and targeted SWSCMs according to performance monitoring data. According to the JSCS guidance for direct discharge screening evaluations and the ODEQ *Guidance for Evaluating the Stormwater Pathway at Upland Sites* (ODEQ 2010), the following site-specific factors were evaluated:

- Identification and characterization (e.g., type of release, area of release, size of release, age of release) of potential contaminant sources;
- Magnitude of catch basin solids and stormwater exceedance at each sampling point and proximity of sampling point to the river;
- Regional background soil concentrations of naturally occurring chemicals (i.e., metals) for evaluating stormwater sediment;
- Presence of bioaccumulative chemicals;
- Site hydrology including consideration of, but not limited to, the following:
    - Site conditions (e.g., land use, surface conditions, topography)
    - Size of drainage (e.g., outfall) basin
    - Location and estimated size of discharge (e.g., river bank, direct to river)
    - Hydrodynamics and runoff volume
- Stormwater system design (e.g., catch basin design and effectiveness) and management (e.g., BMPs, stormwater management plan) both current and future;
- Maintenance and condition of conveyance system (e.g., frequency of catch basin and conveyance line cleanout);
- Contaminant fate and transport including chemical characteristics (e.g., solubility, partitioning coefficients) and physical properties (e.g., density, viscosity) of the COIs;
- Estimate of potential contaminant loading to the river were completed to evaluate changes in loading (see Section 6.1 for additional detail);
- Outfall sediments (i.e., Portland Harbor); and
- Representativeness of the samples.

In order to assess the magnitude of the analytical result exceedance of the applicable SLV, an EQ was calculated for each analyte with an exceedance, as follows:

$$\text{Exceedance Quotient (EQ)} = \frac{\text{Analytical Result}}{\text{Applicable Screening Level Value}}$$

The EQs are calculated based on a comparison to the SLVs (i.e., Portland Harbor ROD CULs and JSCS SLVs for parameters without Portland Harbor ROD CULs). The results of the EQ calculations for the stormwater performance monitoring results are provided in Table 10. The minimum and maximum concentrations observed in stormwater at each sample location and comparison to SLVs is provided on Figures 10 through 19.

The ODEQ has published concentration data for selected compounds in stormwater samples collected from heavy industrial sites within Portland Harbor (ODEQ 2010). The data have been presented in the form of a series of charts of ranked results. These charts are intended to be used as a screening tool to distinguish "typical" industrial stormwater from stormwater containing potentially elevated contaminant concentrations.

The results of a qualitative comparison of the Property stormwater results to these heavy industrial site results are presented in Appendix I. A summary of source control evaluation screening of catch basin solids and stormwater results to SLVs and comparisons to heavy industrial sites within the Portland Harbor is provided in Table 11.

6.1 Contaminant Loading Calculations

Contaminant loading calculations were completed to:

- Assess average load and concentration reductions following implementation of the SWSCM Work Plan
- Compare average concentrations from the Property to other geographically similar locations (i.e., within the River Mile 9 West (RM-9W) geographic area of interest; ODEQ 2020)

This evaluation was completed considering that load estimates provide a better understanding of the potential for recontamination through stormwater than concentration trends alone.

Loading calculations used methodology employed by ODEQ to complete a stormwater contaminant load study to estimate contaminants loads in stormwater discharging to Portland Harbor as described in detail in the *Portland Harbor Stormwater Strategy Update – Status of Recontamination Prevention Data Evaluation* (ODEQ 2020).

Five COIs (zinc, total PCBs, total PAHs, BEHP, and TSS) were selected for evaluating contaminant loading to be consistent with the approach used by ODEQ, and because each of these contaminants are identified COIs at the Property or have chemical and physical properties representative of the various families of chemical compounds that are COIs at the Property.

In general, this evaluation consisted of the following:

- Estimation of the Annual Stormwater Runoff Volume (runoff coefficient weighted site area multiplied by the average rainfall depth)
  - Runoff Coefficient Weighted Site Area is the total site area, including all surface types multiplied by the runoff coefficient.

  - Average Rainfall Depth is the average annual rainfall during the monitoring year(s) from the COP HYDRA network rain gauge at 3395 NW Yeon Street (https://or.water.usgs.gov/non-usgs/bes/yeon.html).

- Estimation of Annual Load (average concentration of COI multiplied by the Annual Stormwater Runoff Volume)
  - Average Concentration of COI is the average concentration from all events and locations at the site during the selected monitoring period.
  - Annual Stormwater Runoff Volume (see description above).

Contaminant loading calculations are detailed in Appendix J and discussed for each selected COI in Section 6.2. Note that contaminant loading calculations represent a high level estimation of loading and are completed for comparison purposes only.

6.2 Data Evaluation

6.2.1 Metals

Arsenic, cadmium, copper, lead, and zinc exceeded the SLVs for stormwater; however, decreases in the magnitude of detections were observed relative to SWSCE stormwater samples. The EQs for arsenic were between 10 and 61. The EQs were less than 10 for all remaining metals (i.e., arsenic, cadmium, copper, lead, and zinc), with limited exceptions for lead.

The weight-of-evidence evaluation for specific COIs is discussed below.

6.2.1.1 Arsenic

The EQs for arsenic in performance monitoring samples ranged from 0.0 to 61 (Figure 10). These concentrations represent a decrease relative to SWSCE stormwater samples (i.e., EQs ranged from 0.0 to 611).

A comparison of the arsenic concentrations detected in stormwater discharge at the Property to other industrial sites in Portland Harbor is presented in Appendix I. The concentrations of arsenic in stormwater were within the flat part of the rank-order curve for stormwater at industrial sites. Concentrations in 2020 generally shifted toward the lower rank-order values and concentrations in the rank-order curve relative to 2016-1017 SWSCE results. Additionally, the range of detections continued to decrease over the performance monitoring period (Appendix K). These decreases are attributed to the implementation of BMPs and targeted SWSCMs for solids reduction (e.g., pavement curbing, repaving, increased frequency of site sweeping, annual catch basin cleaning, addition of catch basin filter fabric inserts, and solids filter in Trench-1).

Arsenic is a naturally occurring element and is found at relatively high concentrations in the soil in Portland, Oregon. The background concentration for arsenic in the Portland basin is 8.8 milligrams/kilogram (mg/kg) (ODEQ 2013). This is very similar to the average concentration of the 9.2 mg/kg observed in catch basin solids in the SWSCE. Only three locations (CB-1G, CB-4A, and Trench-1) had concentrations above the background concentrations for arsenic (ERM 2018). Arsenic was detected at a concentration of 2.79 mg/kg in the source tracing solids sample collected upgradient of CB-4A.

The SLV for arsenic in stormwater (0.018 micrograms per liter [µg/L]) is a Portland Harbor ROD “applicable or relevant and appropriate requirement” based on Federal National Recommended Water Quality Criteria, which is a conservative value for human consumption of aquatic organisms and drinking water. For comparison, the detection limit for arsenic is 0.27 µg/L. The most conservative risk-based value for human health under Oregon Ambient Water Quality Criterion is 2.1 µg/L based on human consumption of aquatic organisms only (i.e., no drinking water pathway). Performance monitoring results for arsenic were below this Oregon Ambient Water Quality Criterion.

The geometric mean for arsenic in stormwater samples collected from Outfall 18 in the COP Source Control Measures Effectiveness Demonstration was measured at 1.63 µg/L (BES 2015). Each of the detected arsenic concentrations in the performance monitoring samples was less than the Outfall 18 arsenic geometric mean (Table 9 and Appendix L).

The 1200-Z Permit does not have a state-wide benchmark concentration for arsenic. For reference purposes, the Timber Product Sector specific benchmark for arsenic, although not applicable to the Property, is 150 µg/L. Stormwater discharge results were two orders of magnitude below the sector-specific benchmark concentration.

The decreased concentrations of arsenic in performance monitoring samples indicates that BMPs and targeted SWSCMs completed and in progress (i.e., repaving in DB-4) have been effective at controlling sources of arsenic identified on the Property. Based on the low concentrations of arsenic in stormwater samples, which are within the typical range for industrial properties in the vicinity, arsenic has low potential for the recontamination of sediment and unacceptable risk to in-water receptors in the Willamette River. No additional SWSCMs are warranted for arsenic.

6.2.1.2 Cadmium

The EQs for cadmium in performance monitoring samples ranged from 0.5 to 2.8 (Figure 11). These concentrations represent a decrease relative to the SWSCE stormwater samples (i.e., ranged from 0.0 to 37.2).

A comparison of the cadmium concentrations detected in stormwater discharge at the Property to other industrial sites in Portland Harbor is presented in Appendix I. The concentrations of cadmium in stormwater were within the flat part of the rank-order curve for stormwater at industrial sites. Concentrations shifted toward the lower rank-order values and concentrations in the rank-order curve relative to SWSCE results. Additionally, the range of detections continued to decrease over the performance monitoring period (Appendix K). These decreases are attributed to BMPs and SWSCMs that target reduction of TSS (e.g., pavement curbing, repaving, increased frequency of site sweeping, annual catch basin cleaning, addition of catch basin filter fabric inserts, and solids filter in Trench-1) and metals (e.g., filtration media and metals exposure reduction) in stormwater.

Cadmium is a naturally occurring element and is found at moderate concentrations in the soil in Portland, Oregon. The background concentration for cadmium in the Portland basin is 0.63 mg/kg (ODEQ 2013). The reported background concentration is similar to the concentration of the 0.46 mg/kg observed in the source tracing solids sample collected upgradient of CB-4A.

The geometric mean for cadmium in stormwater samples collected from Outfall 18 in the COP Source Control Measures Effectiveness Demonstration was measured at 0.92 µg/L (BES 2015). Each of the detected cadmium concentrations in the performance monitoring samples were below the Outfall 18 geometric mean by at least a factor of 3 (Table 9 and Appendix L).

Concentrations of cadmium in stormwater are likely to have some association with particulates that would be captured in the lynch-style catch basins at the Property. The detections that were observed in the high range for stormwater discharge samples are associated with high TSS concentrations at Trench-1 in May 2017 and CB-4A in June 2017 (ERM 2018). As noted above, BMPs and SWSCMs that target solids reduction appear to have been effective at reducing cadmium concentrations.

The decreased concentrations of cadmium in performance monitoring samples indicates that BMPs and targeted SWSCMs completed have been effective at controlling sources of cadmium identified on the

Property. Based on the low concentrations of cadmium in stormwater samples which are typical of industrial properties in the vicinity, cadmium has low potential for the recontamination of sediment and unacceptable risk to in-water receptors in the Willamette River. No additional SWSCMs are warranted for cadmium.

6.2.1.3 Copper

The EQs for copper in performance monitoring samples ranged from 0.0 to 5.4 (Figure 12). These EQs represent a decrease relative to SWSCE stormwater samples (i.e., EQs ranged from 0.0 to 20.4).

A comparison of the copper concentrations detected in stormwater discharge at the Property to other industrial sites in Portland Harbor is presented in Appendix I. The concentrations of copper in stormwater were in the flat part of the rank-order curve for stormwater discharge at industrial sites. Concentrations shifted toward the lower rank-order values and concentrations in the rank-order curve relative to SWSCE results. These decreases are attributed to BMPs and SWSCMs that target reduction of TSS (e.g., pavement curbing, repaving, increased frequency of site sweeping, annual catch basin cleaning, addition of catch basin filter fabric inserts, and solids filter in Trench-1).

Copper is a naturally occurring element and is found at moderate concentrations in the soil in Portland, Oregon. The background concentration for copper in the Portland basin is 34 mg/kg (ODEQ 2013). For reference purposes, the NPDES Stormwater Discharge Permit benchmark in the Willamette Basin for copper is 20 µg/L. The 1200-Z Permit benchmark was not exceeded by the performance monitoring stormwater samples.

The geometric mean for copper in stormwater samples collected from Outfall 18 in the City of Portland (COP) Source Control Measures Effectiveness Demonstration was measured at 28.5 µg/L (BES 2015). Each of the detected copper concentrations in the performance monitoring samples was below the Outfall 18 geometric mean (Table 9 and Appendix L).

Concentrations of copper in stormwater are likely to have some association with particulates that would be captured in the lynch-style catch basins at the Property. The detections observed in the high range for stormwater discharge samples are associated with high TSS concentrations at Trench-1 in May 2017 and June 2017 (ERM 2018). As noted above, BMPs and SWSCMs that target solids reduction appear to have been effective at reducing copper concentrations. The decreased concentrations of copper in performance monitoring samples indicate that BMPs and targeted SWSCMs completed have been effective at controlling sources of copper identified on the Property. Based on the low concentrations of copper in stormwater samples, which are typical for industrial properties in the vicinity, copper has low potential for the recontamination of sediment and unacceptable risk to in-water receptors in the Willamette River. No additional SWSCMs are warranted for copper.

6.2.1.4 Lead

The EQs for lead in performance monitoring samples ranged from 0.4 to 22 (Figure 13). These EQs represent a decrease relative to SWSCE stormwater samples (i.e., ranged from 0.0 to 241).

A comparison of the lead concentrations detected in stormwater discharge at the Property to other industrial sites in Portland Harbor is presented in Appendix I. The concentrations of lead in stormwater were within the flat part of the rank-order curve for stormwater at industrial sites. Concentrations shifted toward the lower rank-order values and concentrations in the rank-order curve relative to SWSCE results. Additionally, the range of detections continued to decrease over the performance monitoring period (Appendix K). These decreases are attributed to BMPs and SWSCMs that target reduction of TSS (e.g., pavement curbing, repaving, increased frequency of site sweeping, annual catch basin cleaning, addition of catch basin filter fabric inserts, and solids filter in Trench-1) and metals (e.g., filtration media and metals exposure reduction) in stormwater.

Lead is a naturally occurring element and is found at moderate concentrations in the soil in Portland, Oregon. The background concentration for lead in the Portland basin is 79 mg/kg (ODEQ 2013). The reported background concentration is similar to the concentration of the 59.1 mg/kg observed in source tracing solids sample collected upgradient of CB-4A. Additionally, the 1200-Z Permit benchmark in the Willamette Basin for lead is 40 µg/L. No stormwater samples exceeded this benchmark for lead.

The geometric mean for lead in stormwater samples collected from Outfall 18 in the COP Source Control Measures Effectiveness Demonstration was measured at 37 µg/L (BES 2015). Each of the detected lead concentrations in the performance monitoring samples were below the Outfall 18 geometric mean by at least a factor of 3 (Table 9 and Appendix L).

The decreased concentrations of lead in performance monitoring samples indicates that BMPs and targeted SWSCMs completed have been effective at controlling sources of lead identified on the Property. Based on the low concentrations of lead in stormwater samples, which are typical for industrial properties in the vicinity lead has low potential for the recontamination of sediment and unacceptable risk to in-water receptors in the Willamette River. No additional SWSCMs are warranted for lead.

6.2.1.5 Zinc

The EQs for zinc in performance monitoring samples ranged from 1.7 to 9.5 (Figure 16). These EQs represent a decrease relative to SWSCE stormwater samples (i.e., ranged from 0.0 to 71.2).

A comparison of the zinc concentrations detected in stormwater discharge at the Property to other industrial sites in Portland Harbor is presented in Appendix I. The concentrations of zinc in stormwater were within the flat part of the rank-order curve for stormwater at industrial sites. Concentrations shifted toward the lower rank-order values and concentrations in the rank-order curve relative to SWSCE results. Additionally, the range of detections continued to decrease over the performance monitoring period in each drainage basin with exception to DB-4 (i.e., CB-4A) (Appendix K). These decreases are attributed to BMPs and SWSCMs that target reduction of TSS (e.g., pavement curbing, repaving, increased frequency of site sweeping, annual catch basin cleaning, addition of catch basin filter fabric inserts, and solids filter in Trench-1) and metals (e.g., filtration media and metals exposure reduction) in stormwater. Additional SWSCMs were implemented in DB-4 after the performance monitoring (i.e., rearrangement of IBC totes with galvanized cages) in accordance with the 1200-Z Permit and concentrations have since decreased (i.e., at or below 1200-Z Permit benchmark concentrations).

Zinc is a naturally occurring element and is found at moderate concentrations in the soil in Portland, Oregon. The background concentration for zinc in the Portland basin is 180 mg/kg (ODEQ 2013b). For reference purposes, the 1200-Z Permit benchmark for zinc is 120 µg/L. This benchmark concentration was exceeded in the two thirds of the stormwater discharge samples; however, Univar Solutions is completing ongoing mitigation measures to address these results (i.e., implemented additional metals reduction [Section 4.2.5] following the final performance monitoring event and achieved reductions).

The geometric mean for zinc in stormwater samples collected from Outfall 18 in the COP Source Control Measures Effectiveness Demonstration was measured at 245 µg/L (BES 2015). In the performance monitoring samples, 15 of the 18 detected zinc concentrations were below the Outfall 18 geometric mean (Table 9 and Appendix L). As previously mentioned, ranged detections decrease over the over the performance monitoring period in each drainage basin with exception to DB-4 (i.e., CB-4A) where additional SWSCMs were implemented.

ERM estimated annual mass loading of zinc in stormwater runoff from the Property and compared to the mass loading from properties contributing to RM-9W (ODEQ 2020). Average annual mass loading of zinc calculated with the performance monitoring data decreased by an order of magnitude relative to the SWSCE data (Appendix J).

The decreased concentrations of zinc in performance monitoring samples indicates that BMPs and targeted SWSCMs completed have been effective at controlling sources of zinc identified on the Property. Based on the low concentrations of zinc in stormwater samples which are typical for industrial properties in the vicinity zinc has low potential for the recontamination of sediment and unacceptable risk to in-water receptors in the Willamette River. No additional SWSCMs are warranted for zinc. This COI will continue to be monitored and managed directly under the 1200-Z Permit.

6.2.2 Polychlorinated Biphenyls

PCBs were not detected in 4 out of 18 samples from the 2019/2020 stormwater sampling events; the exception were four locations during the second sample event (13 March 2020) where Aroclor 1268 was the only PCB Aroclor detected (Table 9). As there is no individual SLV for Aroclor 1268, sample results were conservatively compared to the SLV for Total PCBs. The SLV for total PCBs was exceeded at CB-2E, CB-5A, E-1, and STM-1 based on the detections of Aroclor 1268 in these samples. A decrease in number and magnitude of Aroclor 1268 detections was observed relative to the SWSCE sample events.

The EQs for PCBs in performance monitoring samples ranged from 969 to 12,344 (Figure 17). These EQs represent a decrease relative to SWSCE stormwater samples (i.e., ranged from 4,375 to 23,438). As the SLV used to estimate EQ values is for Total PCBs and not for Aroclor 1268, the EQs are not a true representation of the magnitude of SLV exceedance for the Property as Aroclor 1268 was the only Aroclor detected. An analysis of detected concentrations of PCBs confirm that the sole detection was of Aroclor 1268 in stormwater which has been demonstrated through this evaluation to be from building materials and not facility operations.

A comparison of the Total PCB concentrations detected in stormwater discharged at the Property to other industrial sites in Portland Harbor is presented in Appendix I. The concentrations of Aroclor 1268 (the only detected PCB at the Property) in stormwater were in the flat part of the rank-order curve for stormwater at industrial sites. Aroclor 1268 was detected in 4 of the 18 stormwater discharge samples; however, after implementation of the SWSCMs (see Section 4.2.6 and 4.2.7), September results were non detect (Table 9).

There are no SLVs for Aroclor 1268. When compared to the Total PCB SLV for human consumption of fish of 0.0000064 µg/L, any detection of PCBs will result in an exceedance of the SLV. For reference purposes, the 1200-Z Permit reference concentration for Total PCBs is 0.3 µg/L. All stormwater discharge sample concentrations were below the 1200-Z Permit reference concentration.

The geometric mean for total PCBs in stormwater samples collected from Outfall 18 in the COP Source Control Measures Effectiveness Demonstration was calculated at 0.0511 µg/L (BES 2015). The average Total PCB concentrations in the performance monitoring samples for the Property were below the Outfall 18 geometric mean (Appendix L).

ERM estimated annual mass loading and average concentration of the Total PCBs in stormwater runoff from the Property and compared these to RM-9W[1] and SWSCE (ODEQ 2020). The average total PCB concentrations were below the RM-9W average Total PCB concentration for both monitoring periods (i.e., SWSCE and performance monitoring). Additionally, the average annual mass loading and average

[1] River Mile 9W area consists of approximately 11163.3 acres, mostly heavy industrial or parks/open space land use. Stormwater from this area discharges through City outfall basins 18, 19, and 19A (ODEQ 2020). Additional details of this area, including the ODEQ's contaminant load estimates, are summarized in Table 2.6.3.2 and 2.6.5.2, Figure 2.6.3.2, and Appendix C of the *Portland Harbor Stormwater Strategy Update.*

concentrations of total PCBs calculated with the performance monitoring data decreased relative to the SWSCE data (Appendix J).

In 2018, Univar Solutions installed a trench drain filter in Trench-1 to address solids potentially containing Aroclor 1268. In 2020, Univar Solutions conducted target SWSCMs (i.e., material removal and stormwater line cleaning) to address Aroclor 1268 contaminated materials found through source tracing (ERM 2020a). Stormwater samples collected after implementation of these SWSCMs were non-detect for PCBs. No additional SWSCMs are recommended.

6.2.3 Organochlorine Pesticides

Organochlorine pesticides were detected in half of the stormwater discharge samples; however, only two samples had detections of four pesticides (Table 9). The increase in detections relative to the SWSCE stormwater samples is due to lower detection limits, as most of the detections were qualified as estimated (i.e., greater than the MDL and below the MRL).

The EQs for the individual isomers 4,4'-DDD and 4,4'-DDE were below 100. The EQs for 4,4'-DDT ranged between 0 and 20,000. Detections of the 4,4'-DDT isomer were only observed during the September 2020 monitoring event. These detections represent an increase in concentrations relative to the SWSCE samples and the February and March 2020 performance monitoring samples. The SLVs are risk-based regulatory values of 0.000031 µg/L (4,4'-DDD), 0.000018 µg/L (4,4'-DDE), and 0.000022 (4,4'-DDT) that are over an order of magnitude below the lowest detection limit of 0.00046 µg/L.

Calculation of DDx (i.e., sum of DDD. DDE, and DDT isomers) was not completed since the approved list of COIs for organochlorine pesticides is insufficient for the calculation. However, based on results for 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT, it is expected that the Portland Harbor SLV for DDx in surface water of 0.01 µg/L would have been exceeded at three locations (CB-2E, CB-4A, and STM-1) during the September 2020 sampling event. The EQs for DDx would be less than 100.

Dieldrin and heptachlor epoxide were only detected in three samples each with EQs ranging from 106 to 308 (Table 10, Figure 18). The SLVs for dieldrin and heptachlor epoxide are over two orders of magnitude below the detection limits. These EQs represent decreases relative to the SWSCE data. These decreases are attributed to BMPs and SWSCMs that target solids reduction (e.g., pavement curbing, repaving, increased frequency of site sweeping, annual catch basin cleaning, and addition of catch basin filter fabric inserts).

The increased concentrations of 4,4-DDT observed in September 2020 are expected to be attributable to the first stormwater sample of the rain season and/or associated with exposed soil due to deteriorated asphalt (e.g., adjacent to CB-4A) or soil disturbance activities. Univar Solutions is developing a CMMP to prevent future soil disturbance activities from potentially contributing to COIs in stormwater.

The limited frequency and decreased magnitude of detections indicate that organochlorine pesticides do not have the potential for recontamination of sediment and unacceptable risk to in-water receptors in the Willamette River with implementation of a CMMP.

6.2.4 Volatile Organic Compounds

The concentrations of PCE and/or TCE were above the SLVs at three locations (Table 9). In general, the EQs for PCE and TCE were consistent with SWSCE stormwater sample results. September 2020 samples at STM-1 had EQs of 217 and 159 for PCE and TCE, respectively (Table 10, Figure 19).

Additional samples collected at STM-1 showed decreases in PCE and TCE (Figure 5). No new activities, handling, incidents, or releases regarding VOCs have occurred at the Property. The elevated VOC concentrations at STM-1 are attributable to late-2019 soil disturbances in DB-1 (i.e., fall protection footing) and appear not to be associated with a continuous source (i.e., concentrations continue to decrease). Univar Solutions is developing a CMMP to prevent future soil disturbance activities from potentially contributing to COIs in stormwater.

The limited frequency and decreased magnitude of detections indicate that VOCs do not have potential for recontamination of sediment and unacceptable risk to in-water receptors in the Willamette River. No additional SWSCMs beyond the CMMP are recommended.

6.2.5 Phthalate Esters

BEHP was detected at a concentration above the SLV in multiple stormwater discharge samples; however, most of the detections were qualified as estimated (i.e., greater than the MDL and below the MRL) (Table 10, Figure 20). The EQ for these BEHP detections ranged from 1 to 18.5, consistent with SWSCE stormwater samples (i.e., 7.0 to 18.5 with a single exception to the EQ for BEHP in Trench-1 of 135 in June 2017). However, concentrations generally decreased through the performance monitoring period and the two EQs above 10 correlated with samples that had high TSS concentrations.

A comparison of the BEHP concentrations detected in stormwater discharge at the site to other industrial sites in Portland Harbor is presented in Appendix I. The concentrations of BEHP in stormwater were generally in the flat part of the rank-order curve for stormwater at industrial sites and shifted left (i.e., lower rank-order value) in the rank-order curve relative to SWSCE results. Over the performance monitoring period, the number of detections decreased from six to one (Table 9).

This decreasing trend is attributed to BMPs and SWSCMs that target solids reduction (e.g., pavement curbing, repaving, increased frequency of site sweeping, annual catch basin cleaning, and addition of catch basin filter fabric inserts).

The geometric mean for BEHP in stormwater samples collected from Outfall 18 in the COP Source Control Measures Effectiveness Demonstration was measured at 4.3 µg/L (BES 2015). Each BEHP concentration in the performance monitoring samples was below the Outfall 18 geometric mean (Appendix L).

ERM estimated annual mass loading and average concentration of BEHP in stormwater runoff from the Property and compared these to RM-9W and SWSCE (ODEQ 2020). The average BEHP concentrations decreased from above to below the RM-9W average BEHP concentration from the SWSCE to performance monitoring periods (Appendix J and L). Additionally, the average annual mass loading and average concentrations of BEHP calculated with the performance monitoring data decreased by an order of magnitude relative to the SWSCE data (Appendix J).

The concentrations of phthalate esters analyzed during performance monitoring (i.e., diethylphthalate, dimethylphthalate, and di-n-octylphthalate) were either below detection limits or the SLVs.

The low frequency and decreased magnitude of phthalate exceedances (i.e., decrease from 2016–2017 and over the course of the performance monitoring) in the stormwater discharge samples indicate that phthalates do not have potential for recontamination of sediment and unacceptable risk to in-water receptors in the Willamette River. No additional SWSCMs for phthalates are warranted.

6.2.6 Polycyclic Aromatic Hydrocarbons

Select PAHs were detected at concentrations above the SLVs at all sample locations; however, most of the detections were qualified as estimated (i.e., greater than the MDL and below the MRL) (Table 10, Figure 21). The EQ for these PAH detections ranged from 0.1 to 400, a decrease relative to SWSCE stormwater samples (i.e., EQ for these PAH detections ranged from 1 to 577). Additionally, concentrations of individual PAHs generally decreased from February 2019 to September 2020

(Appendix K). EQs were above 10 at all locations, except STM-1, in February 2019. In September 2020, EQs were above 10 only for benzo(a)pyrene and benzo(b)fluoranthene.

Calculation of Portland Harbor JSCS parameter, cPAHs (i.e., calculated as benzo(a)pyrene equivalent of carcinogenic PAHs) was not completed since the approved list of COIs for this group is insufficient for the calculation (Table 3). Since the cPAH SLV of 0.00012 µg/L is approximately one to two orders of magnitude lower than the MDL of the individual PAHs, any detection of an individual carcinogenic PAH compound would have resulted in an exceedance of the SLV. However, given the decreased frequency and magnitude of PAHs observed during performance monitoring, it can be inferred that this same trend would have been observed for cPAHs.

The concentrations of total PAHs in stormwater were in the flat part of the rank-order curve for stormwater at industrial sites, a shift to the far left (i.e., lower than a rank order of 35) in the rank-order curve relative to SWSCE results.

This decreasing trend is attributed to BMPs and SWSCMs that target solids reduction (e.g., pavement curbing, repaving, increased frequency of site sweeping, annual catch basin cleaning, and addition of catch basin filter fabric inserts).

The geometric mean for total PAHs in stormwater samples collected from Outfall 18 in the COP Source Control Measures Effectiveness Demonstration was measured at 0.49 µg/L (BES 2015). The average total PAH concentrations were below the Outfall 18 geometric mean for both monitoring periods (i.e., SWSCE and performance monitoring) (Appendix J and L).

ERM estimated annual mass loading and average concentration of total PAHs in stormwater runoff from the Property and compared these to RM-9W and SWSCE data (ODEQ 2020). The average total PAH concentrations were below the RM-9W average total PAH concentrations for both monitoring periods (i.e., SWSCE and performance monitoring) (Appendix J). Additionally, the average annual mass loading and average concentrations of the total PAHs calculated with the performance monitoring data decreased relative to the SWSCE data (Appendix J).

The low frequency and decreased magnitude of PAH exceedances (i.e., decrease from the SWSCE monitoring and over the course of the performance monitoring) indicate that PAHs do not have potential for recontamination of sediment and unacceptable risk to in-water receptors in the Willamette River. SWSCMs for PAHs are not warranted.

6.2.7 Total Suspended Solids

There is no SLV for TSS in stormwater discharge. However, TSS concentrations have decreased at all locations relative to the SWSCE stormwater samples (Table 9). TSS concentrations in all the stormwater discharge samples were compared to typical industrial concentrations. The concentration of TSS in stormwater discharge was in the flat part of the rank-order curve for stormwater discharge at industrial sites and shifted left (i.e., lower rank-order value) in the rank-order curve relative to SWSCE results. The majority of COIs that had exceedances greater than 100 times the SLVs are usually associated with suspended solids in stormwater, specifically organochlorine pesticides, Aroclor 1268s, and PAHs. Multiple SWSCMs have been implemented to address this correlation as indicated in Section 4.2.

ERM estimated annual mass loading and average concentration of TSS in stormwater runoff from the Property and compared these to RM-9W and SWSCE data (ODEQ 2020). The average TSS concentrations decreased from above to below the RM-9W average TSS concentration and decreased from the SWSCE to the performance monitoring periods (Appendix J). Additionally, from the SWSCE to performance monitoring periods, average concentrations and annual loads decreased by approximately factors of 5 and 7, respectively.

The decreased concentrations of TSS in performance monitoring samples indicate that BMPs and targeted SWSCMs completed have been effective at controlling sources of TSS identified on the Property. No additional SWSCMs are warranted for TSS. This COI will continue to be monitored and managed directly under the 1200-Z Permit.

7 CONCLUSIONS

The source tracing activities and the implementation of SWSCMs described within this SWCEE demonstrate that sources of COIs at the property have been identified and controlled to prevent sediment recontamination or unacceptable risk to in-water receptors at the Portland Harbor Superfund study area of the Willamette River via the stormwater pathway to the Willamette River.

7.1 Effectiveness Evaluation Summary

Stormwater discharge samples were collected in February 2019, March 2020, and September 2020. During each sampling event, grab stormwater samples were collected from stormwater discharge locations within each drainage basin including catch basins CB-2E, CB-4A, CB-5A, and CB-6A, SPCC control valve E-1, and a manhole with combined stormwater STM-1. The stormwater discharge results were screened against applicable SLVs (i.e., Portland Harbor ROD CULs for surface water and JSCS SLVs for parameters without Portland Harbor ROD CULs). COIs with one or more SLV exceedances were carried through into a weight-of-evidence evaluation.

ERM updated the qualitative weight-of-evidence evaluation presented in the SWSCE by assessing the number and magnitude of SLV exceedances observed in performance monitoring data, the overall contaminant loading to the Portland Harbor, a comparison to average basin concentrations, a comparison to other regional industrial sites, and published stormwater criteria.

Results of the updated weight-of-evidence evaluation are presented in Table 11 and summarized as follows:

- Concentrations of manganese and nickel were either below detection limits or less than the SLVs (Figures 14 and 15). These COIs were not carried forward into the updated weight-of-evidence evaluation.
- The magnitude of arsenic, cadmium, copper, lead, phthalates, PCBs as Aroclor 1268, and PAH exceedances measured during the performance monitoring decreased relative to the SWSCE stormwater monitoring (i.e., SWSCE data) and over the course of the performance monitoring period (Figures 9–13, 17, 18, 20, and 21 and Appendix K).
- Zinc concentrations decreased at all locations throughout the performance monitoring period except at the DB-4 monitoring location (CB-4A; Figure 16). Additional SWSCMs for this COI were implemented after the performance monitoring (i.e., rearrangement of IBC totes with galvanized cages) in accordance with the 1200-Z Permit and concentrations have since decreased (i.e., at or below 1200-Z Permit benchmark concentrations and the Outfall 18 geometric mean).
- The elevated 4,4’-DDT concentrations observed at CB-2E, CB-4a, and STM-1 in September 2020 are attributable to sample collection during a “first-flush rain event or soil disturbances in the area (e.g., exposed soil due to deteriorated pavement at CB-4a or fall protection footing).
- The elevated VOC (i.e., PCE and TCE) concentrations observed at STM-1 in September 2020 are attributable to soil disturbances in the area (i.e., fall protection footing) and appear not to be associated with a continuous source (i.e., concentrations continue to decrease).

- Arsenic, cadmium, lead, zinc, PCBs as Aroclor 1268, and PAH concentrations were in the flat part of the rank-order curve for stormwater discharge at industrial sites for all events and locations (Table 11).
- BEHP and TSS concentrations were in the flat part of the rank-order curve for stormwater discharge at industrial sites for all locations during the last two events (March 2020 and September 2020) (Table 11).
- Average concentrations of zinc, TSS, PCBs as Aroclor 1268, BEHP, and PAHs measured during the performance monitoring period decreased relative to the SWSCE monitoring period (i.e., SWSCE data) and were below the RM-9W averages presented in the ODEQ *Update to Stormwater Source Control* (ODEQ 2020; Appendix J).
- Average annual mass loading of zinc, TSS, PCBs as Aroclor 1268, BEHP, and PAHs calculated with the performance monitoring data decreased by an order of magnitude relative to the SWSCE data (Appendix J).
- Average concentrations of arsenic, cadmium, lead, zinc, total PCBs, BEHP, and total PAHs from the Property were below their respective geometric mean concentrations documented by the COP at Outfall 18 (Appendix L).

7.2 Recommendations

Univar Solutions recommends the ongoing management of stormwater at the Property to verify continued effectiveness of BMPs and targeted SWSCMs in preventing sediment recontamination. As described in Section 4.3, the Property attained coverage under the 1200-Z Permit on 18 July 2019 (File No.126427). Univar Solutions is actively implementing site-specific stormwater controls and completing subsequent effectiveness monitoring through ODEQ's Water Quality program and the COP ODEQ's administration of the 1200-Z Permit.

The 1200-Z Permit parameters (e.g., copper, zinc, and TSS) have similar chemical and physical properties to the COIs evaluated in this SWSCEE Report and can be used to evaluate continued effectiveness of BMPs and targeted SWSCMs within a regulatory structure.

Ongoing control of legacy contamination at the Property associated with VOC impacts to soil and groundwater will continue to be controlled by ongoing RCRA cleanup activities. In addition, Univar Solutions will implement a CMMP at the Property to prevent potential for future site development activities to contribute to contamination leaving the site via the stormwater pathway.

8 REFERENCES

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TABLES

Table 1
Drainage Basins Summary
Stormwater Source Control Effectiveness Evaluation
Univar Solutions USA Inc.

Drainage Basin	Number of Catch Basins	Approximate Area Drained (square feet)	Description	Connections to Stormwater Main
DB-1	14	93848	Nine catch basins drain the southern half of rail spur. Three catch basins drain the loading dock area which includes the drum fill area. Stormwater collected in the solvent tank farm area is inspected and discharged to the asphalt surface adjacent to CB-1I. Two catch basins drain the general storage area south of the loading dock.	Single lateral from basin is directly connected to City of Portland-owned 42" stormwater line on site at the lateral identified as S12 on Figure 2.
DB-2	6	105253	Eastern portion of the site including east drive, covered storage structures, and the eastern half of the warehouse. Roof drains from tar and corrugated metal roofs tie into the 42-inch main and drain to the asphalt of concrete surface from the sides of the loading dock. Two floor drains within the covered storage area discharge stormwater collected in surface depressions to the concrete surface of the east drive.	1) 6 catch basins are directly connected to City of Portland-owned 42" stormwater line on site via 3 laterals 2) 3 roof drains are directly connected to City of Portland-owned 42" stormwater line on site. 3) 2 catch basins and 1 underground lateral pipe are directly connected to the City of Portland-owned 42" stormwater line from off site.
DB-3	5	65122	Three floor drains and one trench drain from the loading dock area adjacent to the corrosive tank farm and drum fill area. Roof drains from the warehouse tar roof. Five catch basins and one trench drain from the central rail spur area.	Lateral from basin is directly connected to City of Portland-owned 42" stormwater line on site.
DB-4	3	75664	Three catch basins drain the southern portion of site used for used container storage and truck parking. Drainage includes runoff from the remediation building corrugated metal roof.	1) 2 catch basins are directly connected to City of Portland-owned 42" stormwater line on site. 2) 1 roof drain is directly connected to City of Portland-owned 42" stormwater line on site. 3) 1 non-stormwater catch basin from remediation system is directly connected to City of Portland-owned 42" stormwater line on site. 4) 2 underground lateral pipes without a surface access are directly connected to the City of Portland-owned 42" stormwater line on site. 5) 2 catch basins and 5 underground lateral pipes are directly connected to the City of Portland-owned 42" stormwater line from off site.
DB-5	4	34756	Four catch basins drain the north-western portion of site including rail spur, truck unloading, and employee parking.	1) Lateral from basin is directly connected to City of Portland-owned 42" stormwater line on American Steel property. 2) Underground lateral pipe without surface access is directly connected to the City of Portland-owned 42" stormwater line on site.
DB-6	5	47527	Five catch basins drain the northern portion of the site mainly used for employee parking.	Lateral from basin is directly connected to City of Portland-owned 42" stormwater line on site at the lateral identified as N9 on Figure 2.

Notes:
The ICM groundwater treatment system discharges treated groundwater via catch basin CB-4D directly to the City of Portland owned 42-inch stormwater line via NPDES Permit No. 101613.
Stormflow connections are based on field observations, historical reports (BRI 2004, HLA 1996), and information obtained from City of Portland maps available online at http://www.portlandmaps.com.

Table 2
Summary of SWSCE Screening Evaluation
Stormwater Source Control Effectiveness Evaluation
Univar Solutions USA Inc.

Analyte	Catch Basin Solids (December 2015)		Stormwater (November 2016, March 2017, May 2017, and June 2017)[1]								Proposed Source Control Actions
	SLV Exceedance[2,3]	Above flat part of curve[4]	CUL or SLV Exceedance[3]				Above flat part of curve[4]				
			1 of 4	2 of 4	3 of 4	4 of 4	1 of 4	2 of 4	3 of 4	4 of 4	
Arsenic	CB-1G, CB-2E, CB-4A, CB-5A, Trench-1	CB-1G, CB-4A, Trench-1	Roof-2	CB-3D, Roof-1	-	CB-1G,CB-2E, CB-4A, CB-5A, CB-6A, E-1, STM-1, Trench-1, W-4	-	Trench-1	-	-	- Drainage Basin Surveys in DB-1 through DB-6 - Source Tracing in DB-1, DB-3, and DB-4 - Source Control Measures (if applicable) - Performance Monitoring in DB-1 through DB-6
Cadmium	All	-	CB-3D, E-1, Roof-1	CB-6A, Roof-2	CB-2E, CB-5A	CB-1G, CB-4A, STM-1, Trench-1, W-4	CB-2E, CB-4A, W-4	Trench-1	-	-	- Drainage Basin Surveys in DB-1 through DB-6 - Source Tracing in DB-1, DB-3, and DB-4 - Source Control Measures (if applicable) - Performance Monitoring in DB-1 through DB-6
Chromium	CB-1G, Trench-1	CB-1G, Trench-1	-	-	-	-	CB-4A, STM-1, W-4	Trench-1	-	-	NA
Copper	-	-	-	Roof-2	-	CB-1G,CB-2E, CB-3D, CB-4A, CB-5A, CB-6A, Roof-1, E-1, STM-1, Trench-1, W-4	Trench-1	-	-	-	NA
Lead	Trench-1	-	Roof-2	Roof-1	-	CB-1G,CB-2E, CB-3D, CB-4A, CB-5A, CB-6A, E-1, STM-1, Trench-1, W-4	W-4	Trench-1	-	-	- Drainage Basin Surveys in DB-1 through DB-6 - Source Tracing in DB-1, DB-3, and DB-4 - Source Control Measures (if applicable) - Performance Monitoring in DB-1 through DB-6
Manganese	-	NA	E-1, Roof-1	CB-2E, CB-3D, Roof-2	CB-6A, W-4	CB-1G, CB-4A, CB-5A, STM-1, Trench-1,	NA				NA
Mercury	CB-1G, CB-4A, CB-5A, Trench-1	CB-5A	-	-	-	-	-	-	-	-	NA
Nickel	CB-1G, CB-2E, CB-4A, Trench-1	CB-1G, Trench-1	Trench-1, W-4				Trench-1, W-4	CB-4A	-	-	NA
Zinc	All	CB-4A, Trench-1	-	CB-2E	-	CB-1G,CB-3D, CB-4A, CB-5A, CB-6A, Roof-1, Roof-2, E-1, STM-1, Trench-1, W-4	CB-4A, Trench-1, W-4,	-	-	-	- Drainage Basin Surveys in DB-1 through DB-6 - Source Tracing in DB-1, DB-3, and DB-4 - Source Control Measures in DB-1, DB-3, and DB-4 - Performance Monitoring in DB-1 through DB-6

Table 2
Summary of SWSCE Screening Evaluation
Stormwater Source Control Effectiveness Evaluation
Univar Solutions USA Inc.

Analyte	Catch Basin Solids (December 2015)		Stormwater (November 2016, March 2017, May 2017, and June 2017)[1]								Proposed Source Control Actions
	SLV Exceedance[2,3]	Above flat part of curve[4]	CUL or SLV Exceedance[3]				Above flat part of curve[4]				
			1 of 4	2 of 4	3 of 4	4 of 4	1 of 4	2 of 4	3 of 4	4 of 4	
PCBs	CB-2E, CB-6A, Trench-1	CB-2E, Trench-1	CB-2E, E-1, STM-1	CB-4A	W-4	Trench-1	-	-	-	-	- Drainage Basin Surveys in DB-1 through DB-6 - Source Tracing in DB-1, DB-3, and DB-4 - Source Control Measures (if applicable) - Performance Monitoring in DB-1 through DB-6
DDx	All	NA	CB-1G, CB-2E, CB-5A, CB-6A	Trench-1, W-4	-	-	NA				- Drainage Basin Surveys in DB-1 through DB-6 - Source Control Measures (if applicable) - Performance Monitoring in DB-1 through DB-6
VOCs	-	NA	E-1 and STM-1	E-1 and STM-1	E-1, STM-1, and W-4	E-1	NA				- Drainage Basin Surveys in DB-1 through DB-6 - Source Tracing in DB-1 - Source Control Measures (if applicable) - Performance Monitoring in DB-1 through DB-6
BEHP	All	CB-1G, CB-4A, Trench-1	W-4	Roof-2, Trench-1	-	-	-	-	-	-	- Drainage Basin Surveys in DB-1 through DB-6 - Source Tracing in DB-1, DB-3, and DB-4 - Source Control Measures (if applicable) - Performance Monitoring in DB-1 through DB-6
PAHs	-	-	CB-1G, CB-2E, CB-3D, CB-4A, CB-6A, STM-1, Trench-1	CB-5A, E-1	-	-	-	-	-	-	- Drainage Basin Surveys in DB-1 through DB-6 - Source Control Measures (if applicable) - Performance Monitoring in DB-1 through DB-6
TSS	NA	NA	NA	NA	NA	NA	CB-1G, CB-2E, CB-3D, STM-1	CB-5A, CB-6A	Trench-1	-	- Drainage Basin Surveys in DB-1 through DB-6 - Source Control Measures (if applicable) - Performance Monitoring in DB-1 through DB-6

Notes:
Source tracing includes a drainage basin survey followed by source tracing samples, if necessary.
BEHP = bis(2-Ethylhexyl)phthalate
CUL = cleanup level
DEQ = Department of Environmental Quality
EPA = Environmental Protection Agency
JSCS = Joint Source Control Strategy
PCBs = Polychlorinated biphenyls
ROD = Record of Decision
SLVs = Screening level values
TSS = total suspended solids
VOCs = volatile organic compounds
[1] = Samples locations CB-3D and Roof-2 were sampled during three of four storm events in March 2017, May 2017, and June 2017.
[2] = Development of Oregon Background Metals Concentrations in Soils. Technical Report. DEQ 2013
[3] = Screening levels are Portland Harbor ROD CULs (EPA 2017) supplemeneted with the highlighted screening levels in the Portland Harbor Joint Source Control Strategy, Final, Table 3-1 Revision, July 2007
[4] = DEQ Guidance for Evaluating the Stormwater Pathway at Upland Sites Appendix E: Tool for Evaluating Stormwater Data

Table 3
Source Tracing and Performance Monitoring Sampling Matrix
Stormwater Source Control Effectiveness Evaluation
Univar Solutions USA Inc.

Sample Location	Location Identification	DB-Survey	Source Tracing[1,2]			Stormwater Discharge Sampling						
			Metals[3]	BEHP[4]	PCBs[5]	Metals[3]	PCBs[5]	Pesticides[6]	VOCs[7]	Phthalate Esters[4]	PAHs[8]	TSS
DB-1	STM-1	**X**				**X**	**X**	**X**	**X**	**X**	**X**	**X**
	DB-1-Source Solid		X	X	**X**							
	DB-1-Source Wipe		**X**	**X**	**X**							
DB-2	CB-2E	**X**				**X**	**X**	**X**	**X**	**X**	**X**	**X**
DB-3	E-1	**X**				**X**	**X**	**X**	**X**	**X**	**X**	**X**
	DB-3-Source Solid		X	X	**X**							
	DB-3-Source Wipe		**X**	**X**	**X**							
DB-4	CB-4A	**X**				**X**	**X**	**X**	**X**	**X**	**X**	**X**
	DB-4-Source Solid		**X**	**X**	**X**							
	DB-4-Source Wipe		**X**	**X**	**X**							
DB-5	CB-5A	**X**				**X**	**X**	**X**	**X**	**X**	**X**	**X**
DB-6	CB-6A	**X**				**X**	**X**	**X**	**X**	**X**	**X**	**X**
Total Samples per Location		6	6	6	6	6	6	6	6	6	6	6

Notes:
Bold *indicates sample was collected.*
[1] = Surface wipe sample(s) collected from building and facility materials upgradient of location designated.
[2] = Solids sampling for source tracing collected as a composite from catch basin or ground area upgradient of location designated.
[3] = Metals analyses for stormwater are limited to arsenic, cadmium, lead, and zinc. Metals analyses for stormwater are limited to arsenic, cadmium, copper, lead, manganese, nickle, and zinc.
[4] = Analysis of phthalate esters for source tracing will be limited to bis-2-ethylhexyl phthalate (BEHP). Analysis of phthalate esters for stormwater will be limited to bis-2-ethylhexyl phthalate (BEHP), butylbenzylphthalate, dibutyl phthalate, diethyl phthalate, dimethyl phthalate, and di-n-octylphthalate.
[5] = Analysis of PCBs as Aroclors.
[6] = Analysis of organochlorine pesticides is limited to 4,4'-DDD, 4,4'-DDT, 4,4'-DDE, dieldrin, and heptachlor epoxide.
[7] = Analysis of VOCs is limited to chloroform, tertrachloroethene, trichloroethene, and vinyl chloride.
[8] = Analysis of PAHs is limited to benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, fluoranthene, indeno(1,2,3-cd)pyrene, and pyrene.
PCBs - Polychlorinated biphenyls
VOCs - Volatile Organic Compounds
PAHs = Polycyclic Aromatic Hydrocarbons
X = Location and analyte identified for source tracing and stormwater discharge monitoring in the SWSCM Work Plan.

Table 4
Sampling Location Description and Rationale
Stormwater Source Control Effectiveness Evaluation
Univar Solutions USA Inc.

Drainage Feature	Sample Site[1]	Location Identification	Sample Type	Location Description	Rationale
DB-1	Manhole STM-1	STM-1	Stormwater	Storm manhole location representative of combined runoff leaving DB-1 which includes drum fill area and solvent tank farm dock and loading areas in roadway.	Sample location selected for performance monitoring of BMPs and SCMs.
	Upgradient of SPCC control W-4*	DB-1-Source Solids	Source Tracing	Catch basin location for solids sample within dock area location upgradient of W-4 which includes dock and solvent loading areas.	Represents source area to W-4 in DB-1.
	Upgradient of SPCC control W-4	DB-1-Source Wipe	Source Tracing	Wipe sample(s) will be collected from building and/or facility materials.	Represents source area to W-4 in DB-1.
	East Drive Upgradient of STM-1 (CB-1B and CB-1J)	DB-1-Source Stormwater	Source Tracing	Catch basin locations representative of combined runoff from the loading areas in roadway (East Drive) upgradient of STM-1.	Represents source area to STM- from roadway in DB-1.
	Dock Area Upgradient of STM-1 (W-4)	DB-1-Source Stormwater	Source Tracing	Location representative of combined runoff from the drum fill area and solvent tank farm dock upgradient of STM-1.	Represents source area to STM-1 from dock in DB-1.
	Construction Area Upgradient of STM-1 (CB-1C and CB-1A)	DB-1-Source Stormwater	Source Tracing	Catch basin locations representative of combined runoff from construction activities area that may have exposed contaminated soil upgradient of STM-1.	Represents source area to STM-1 from construction area in DB-1.
	Paint Shed	DB-1-Source Material	Source Tracing	Location representative of wipe sample.	Represents source material to Trench-1 and DB-1.
DB-2	Catch basin CB-2E	CB-2E	Stormwater	Catch basin sample location for stormwater.	Sample location selected for performance monitoring of site wide BMPs and SCMs.

Table 4
Sampling Location Description and Rationale
Stormwater Source Control Effectiveness Evaluation
Univar Solutions USA Inc.

Drainage Feature	Sample Site[1]	Location Identification	Sample Type	Location Description	Rationale
DB-3	SPCC control E-1	E-1	Stormwater	SPCC control valve location representative of combined runoff leaving DB-3 which includes neutralization area, corrosive tank farm dock, and loading areas as well as runoff from tar roof materials.	Sample location selected for performance monitoring of BMPs and SCMs.
	Upgradient of trench drain on dock*	DB-3-Source Solid	Source Tracing	Catch basin sample location for solids. Represents corrosive tank farm loading area in the vicinity of Trench-1.	Represents source area to Trench-1 in DB-3.
	Upgradient of trench drain on dock	DB-3-Source Wipe	Source Tracing	Wipe samples will be collected from building and/or facility materials.	Represents source area to Trench-1 in DB-3.
	Cotton Shed	DB-3-Source Material	Source Tracing	Location representative of wipe sample.	Represents source material to Trench-1 and DB-3.
DB-4	Catch basin CB-4A	CB-4A	Stormwater	Catch basin sample location for stormwater. Represents truck traffic sample and empty drum/tote storage area runoff. Sample location will be modified to achieve a sample more representative of actual discharge.	Sample location selected for performance monitoring of BMPs and SCMs.
	Upgradient of catch basin CB-4A	DB-4-Source Solid	Source Tracing	Solids location from ground area upgradient of catch basin CB-4A.	Represents source area to CB-4A in DB-4.
	Upgradient of catch basin CB-4A	DB-4-Source Wipe	Source Tracing	Wipe sample(s) will be collected from building and/or facility materials.	Represents source area to CB-4A in DB-4.
DB-5	Catch basin CB-5A	CB-5A	Stormwater	Catch basin sample location for solids and stormwater.	Sample location selected for performance monitoring of site wide BMPs and SCMs.
DB-6	Catch basin CB-6A	CB-6A	Stormwater	Catch basin sample location for solids and stormwater.	Sample location selected for performance monitoring of site wide BMPs and SCMs.

Notes:
1 = Sample locations indicated are based on best available information. Locations for solids sampling to be confirmed following DB-area survey.
** = Location did not contain enough solids to collect samples.*

Table 5
Drainage Basin Survey Results
Stormwater Source Control Effectiveness Evaluation
Univar Solutions USA Inc.

COI	Potential Source	Drainage Basin					
		DB-1	DB-2	DB-3	DB-4	DB-5	DB-6
Arsenic	Exposed soil / deteriorating pavement				**S**		
	Pallet jack batteries				**W**		
	IBC tote galvanized metal	X		X	**W**		
	Galvanized metal siding (not painted)	**W**		**W**			
	Treated wood panel (not painted)	**W**		**W**			
	Paint / sealant on concrete			**W**			
Cadmium	Exposed soil / deteriorating pavement				**S**		
	Galvanized metal roof	X	X	X	X		
	Pallet jack batteries				**W**		
	IBC tote galvanized metal				**W**		
	Galvanized metal siding (not painted)	**W**		**W**			
	Treated wood panel (not painted)	**W**		**W**			
	Paint / sealant on concrete			**W**			
	Truck traffic	X	X	X	X	X	X
Lead	Exposed soil / deteriorating pavement				**S**		
	Galvanized metal roof	X	X	X	X		
	Pallet jack batteries				**W**		
	IBC tote galvanized metal	X		X	**W**		
	Galvanized metal siding (not painted)	**W**		**W**			
	Treated wood panel (not painted)	**W**		**W**			
	Paint / sealant on concrete			**W**			
	Truck traffic	X	X	X	X	X	X
Zinc	Exposed soil / deteriorating pavement				**S**		
	Galvanized metal roof	X	X	X	X		
	Pallet jack batteries				**W**		
	IBC tote galvanized metal	X		X	**W**		
	Galvanized metal siding (not painted)	**W**		**W**			
	Treated wood panel (not painted)	**W**		**W**			
	Paint / sealant on concrete			**W**			
	Truck traffic	X	X	X	X	X	X
PCBs (Aroclor 1268)	Exposed soil / deteriorating pavement				**S**		
	Treated wood column (painted)	**W**					
	Paint shed walls (old)	**W, M**					
	Cotton shed walls (old)		**M**				
	Paint / sealant on concrete			**W**			
	Window glaze			**W**			
BEHP	Exposed soil / deteriorating pavement				**S**		
	IBC tote plastic bottom	**W**			X		
	Plastic 55-gallon drum	**W**			X		
	Plastic pallet wrap	X			**W**		
	Truck traffic	X	X	X	X	X	X
VOCs	Construction activities that may have exposed contaminated soil	**SW**		**SW**			

Notes:
BEHP = Bis(2-ethylhexyl) Phthalate
COI = Contaminant of interest
DB = Drainage Basin (e.g., DB-1 is Drainage Basin 1)
PCBs = Polychlorinated biphenyls
VOCs = Volitale Organic Compounds
X = Indicates potential source material for COI identified in the drainage basin.
M *= Indicates material identified for material sampling*
S *= Indicates material identified for collection of solids sample*
SW *= Indicates locations identified for stormwater source tracing samples*
W *= Indicaties material selected for wipe sample*

Table 6
Solids Sample Results
Stormwater Source Control Effectiveness Evaluation
Univar Solutions USA Inc.

Parameter Group	Constituent	Screening Level[1]		CB-4A Upgradient Solids	
		µg/kg		µg/kg	
Metals	Arsenic	3,000	a	**2,970**	
	Cadmium	510	a	**463**	**J**
	Lead	196,000	a	**59,100**	**J+**
	Zinc	459,000	a	**283,000**	
PCBs Aroclors	Aroclor 1016	530	b	2.9	UJ
	Aroclor 1221	--		2.9	UJ
	Aroclor 1232	--		2.9	UJ
	Aroclor 1242	--		2.9	UJ
	Aroclor 1248	1500	b	2.9	UJ
	Aroclor 1254	300	b	**46**	**J**
	Aroclor 1260	200	b	2.9	UJ
	Aroclor 1262	--		2.9	UJ
	Aroclor 1268	--		**64**	**J**
	Total PCBs	9	a	**110**	**J**
Phthalate Esters	Bis(2-ethylhexyl)phthalate	135	a	**950**	**J**

Notes:

J = Result is estimated

J+ = Result is estimated with a high bias
U = Analyte not detected
UJ = Result is estimated to be not detected
µg/kg = micrograms per kilogram
[1] = Screening levels are Portland Harbor ROD CULs (EPA 2017) supplemeneted with the highlighted screening levels
[2] = Development of Oregon Background Metals Concentrations in Soils. Technical Report. ODEQ 2013
JSCS - Joint Source Control Strategy
SLVs = Screening level values

Screening Level Footnotes:
a = Portland Harbor ROD CUL for Riverbank Soil/Sediment
b = Portland Harbor JSCS SLV

Table 7
Wipe Sample Results
Stormwater Source Control Effectiveness Evaluation
Univar Solutions USA Inc.

Sample Location	Location[1]	Location Identification[1]	Sample ID	Photo Log Number	Source Tracing Results											
					Metals (µg/sample)								BEHP (µg/sample)		PCBs (µg/sample)	
					Arsenic		Cadmium		Lead		Zinc		Bis(2-ethylhexyl) Phthalate		Aroclor 1268	
DB-1	IBC tote plastic bottom	South of paint shed	DB1-1	7, 8									**0.24**	**J**		
	Plastic 55-gallon drum	South of paint shed	DB1-2	9, 10									**0.23**	**J**		
	Galvanized metal siding (painted)	Newer building on platform	DB1-3	11, 12	**0.26**	**j**	**0.014**	**j**	**0.384**	**J+**	**81.5**					
	Treated wood column (painted)	West side of column	DB1-4	13	**0.07**	**j**	**0.242**		**44.3**		**134**					
	Treated wood column (painted)	South side of column	DB1-4A	14											0.10	UJ
	Paint shed walls (old)	South side of paint shed	DB1-5	15, 16											**1200**	**J**
DB-3	Galvanized metal siding (not painted)	South side of tool shed on west side of facility	DB3-1	17, 18	**1.34**		**0.259**		**23.1**		**1760**					
	Treated wood panel (not painted)	West side of cotton shed by trench 1	DB3-2	19, 20	**1370**		**0.365**		**5.04**		**262**					
	Paint / sealant on concrete	Northwest corner of paint shed	DB3-3A	21, 22	**1.22**		**1.44**		**834**		**1700**					
	Paint / sealant on concrete	Northwest corner of paint shed	DB3-3B	23, 24											0.10	UJ
	Galvanized metal siding (not painted)	West side of cotton shed by trench 1	DB3-4	25, 26	**0.40**	**j**	**0.029**		**1.57**		**1690**					
	Window glaze	West side of cotton shed above trench 1	DB3-5	--											0.10	UJ
DB-4	Pallet jack batteries	East of CB-4A	DB4-1	27, 28	**1.05**		**0.108**		**91.5**		**209**					
	Plastic pallet wrap	West of CB-4A	DB4-2	29, 30									0.18	UJ		
	IBC tote galvanized metal	West of CB-4A	DB4-3	31, 32	**0.34**	**j**	**0.012**	**j**	**1.01**		**1030**					

Notes:
j = Result is detected between the method detection limit and reporting limit
J = Result is estimated
J+ = Result is estimated with a high bias
U = Analyte not detected
UJ = Result is estimated to be not detected
µg = micrograms

Table 8
Material Sample Results
Stormwater Source Control Effectiveness Evaluation
Univar Solutions USA Inc.

Location	Sample ID	Aroclor 1268 (µg/kg)	Parts per Million Equivalent
Cotton Shed	Cottonshed_20191127	54,300,000.00	54300.00
Paint Shed	1Paintshed_20191127	27,700,000.00	27700.00
Paint Shed	2Paintshed_20191127	20,800,000.00	20800.00

Notes:
µg/kg = micrograms per kilogram

Table 9
Performance Monitoring Results
Stormwater Source Control Effectiveness Evaluation
Univar Solutions USA Inc.

Constituent	Unit	Screening Level	Source	Catch Basin (CB-2E)						Catch Basin (CB-4A)						Catch Basin (CB-5A)							
				2/14/2019		3/13/2020		9/23/2020		2/14/2019		3/13/2020		9/23/2020		2/14/2019		3/13/2020		9/23/2020		9/23/2020 - DUP	
Metals (SW6020)																							
Arsenic	ug/L	0.018	a	**1.1**		**0.4**	j	**0.63**		**0.49**	j	**0.3**	j	**0.49**	j	**0.18**	j	**0.32**	j	**0.43**	j	**0.39**	j
Cadmium	ug/L	0.094	b	**0.262**		**0.116**		**0.128**		**0.146**		**0.077**		**0.159**		**0.066**		**0.063**		**0.072**		**0.069**	
Copper	ug/L	2.74	a	**10.3**		**6.21**		**7.31**		**4.55**		**4.17**		**9.66**		**3.99**		**11.9**		**13.1**		**13.1**	
Lead	ug/L	0.54	b	**11.9**		**0.498**		**2.31**		**6.92**		**0.214**		**1.11**		**1.92**		**1.53**		**1.64**		**1.56**	
Manganese	ug/L	100	a	**51.1**		**13.8**		**14.3**		**16.2**		**26.0**		**49.5**		**15.6**		**22.2**		**25.3**		**24.8**	
Nickel	ug/L	16	b	**2.16**		**1.09**		**1.32**		**1.18**		**1.16**		**3.55**		**1.03**		**1.87**		**2.24**		**2.13**	
Zinc	ug/L	36.5	a	**268**		**127**		**86.5**		**312**		**155**		**347**		**68.7**		**122**		**136**		**132**	
PCB Aroclors (SW8082)																							
Aroclor 1016	ug/L	0.96	b	0.014	U	0.0032	U	0.0064	U	0.0032	U	0.0032	U	0.0064	U	0.03	U	0.0032	UJ	0.0064	U	0.0064	U
Aroclor 1221	ug/L	0.034	b	0.0032	U	0.0032	U	0.0064	U	0.0032	U	0.0032	U	0.0064	U	0.0032	U	0.0032	UJ	0.0064	U	0.0064	U
Aroclor 1232	ug/L	0.034	b	0.017	U	0.0032	U	0.0064	U	0.0032	U	0.0032	U	0.0064	U	0.007	U	0.0032	UJ	0.0064	U	0.0064	U
Aroclor 1242	ug/L	0.034	b	0.0096	U	0.0032	U	0.0064	U	0.0032	U	0.0032	U	0.0064	U	0.0065	U	0.0032	UJ	0.0064	U	0.0064	U
Aroclor 1248	ug/L	0.034	b	0.0081	U	0.0032	U	0.0064	U	0.0032	U	0.0032	U	0.0064	U	0.0095	U	0.0032	UJ	0.0064	U	0.0064	U
Aroclor 1254	ug/L	0.033	b	0.0059	U	0.0032	U	0.0064	U	0.028	U	0.0032	U	0.0064	U	0.0084	U	0.0032	UJ	0.0064	U	0.0064	U
Aroclor 1260	ug/L	0.034	b	0.045	U	0.0032	U	0.0064	U	0.044	U	0.0032	U	0.0064	U	0.012	U	0.0032	UJ	0.0064	U	0.0064	U
Aroclor 1262	ug/L	--		0.048	U	0.0032	U	0.0064	U	0.043	U	0.0032	U	0.0064	U	0.0083	U	0.0032	UJ	0.0064	U	0.0064	U
Aroclor 1268	ug/L	--		0.035	U	**0.014**		0.0064	U	0.034	U	0.0032	U	0.0064	U	0.0074	U	**0.0062**	J-	0.0064	U	0.0064	U
Total PCB Aroclors	ug/L	0.0000064	a	0.048	U	**0.014**		0.0064	U	0.044	U	0.0032	U	0.0064	U	0.03	U	**0.0062**		0.0064	U	0.0064	U
Organochlorine Pesticides (SW8081B)																							
4,4'-DDD	ug/L	3.10E-05	b	0.0012	U	**0.0011**	j	**0.00066**	J	0.0012	U	0.00057	U	0.00076	U	0.0012	U	0.00057	U	**0.00082**	J	**0.00082**	J
4,4'-DDE	ug/L	1.80E-05	b	0.0019	U	0.00046	U	**0.0018**		0.0019	U	0.00046	U	0.00073	U	**0.00096**	J	0.00046	U	**0.0012**	J	0.00046	U
4,4'-DDT	ug/L	2.20E-05	b	0.11	U	0.0022	U	**0.035**		0.13	U	0.00075	U	**0.44**		0.0039	U	0.0048	U	0.0029	U	**0.004**	J
Dieldrin	ug/L	5.40E-06	b	0.00088	U	0.00074	U	0.00044	U	0.00088	U	0.00044	U	0.00044	U	0.00088	U	0.00044	U	**0.0009**	j	0.00044	U
Heptachlor epoxide	ug/L	3.90E-06	b	0.00058	U	**0.00084**	j	0.00029	U	0.00058	U	0.00029	U	0.00029	U	0.00069	U	0.0019	U	**0.00042**	J	0.00029	U
Volatile Organic Compounds (SW8260C)																							
Chloroform	ug/L	0.17	b	0.072	U	0.072	U	0.072	U	0.072	U	0.072	U	0.072	U	0.072	U	0.072	U	0.072	U	0.072	U
Tetrachloroethene (PCE)	ug/L	0.12	b	0.099	U	0.099	U	0.099	U	0.099	U	0.099	U	**0.12**	j	0.099	U	0.099	U	0.099	U	**0.1**	j
Trichloroethene (TCE)	ug/L	0.17	b	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Vinyl Chloride	ug/L	0.015	b	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U
Phthalate Esters (SW8270D)																							
Bis(2-ethylhexyl)phthalate	ug/L	0.2	a	**3.7**		**0.5**	j	**1.8**		**3.5**		**0.2**	j	1	U	**0.53**	j	**0.4**	j	1	U	1	U
Butylbenzylphthalate	ug/L	3	b	**0.15**	j	0.021	U	**0.30**		**0.10**	j	**0.12**	j	0.022	U	**0.045**	j	0.021	U	0.021	U	0.021	U
Dibutyl phthalate	ug/L	3	b	**0.13**	j	**0.094**	j	0.2	U	**0.13**	j	**0.055**	j	0.2	U	**0.12**	j	**0.15**	j	0.2	U	0.2	U
Diethyl phthalate	ug/L	3	b	**0.20**		**0.044**	j	**0.088**	J+	**0.24**		0.015	U	**0.091**	J+	**0.13**	j	**0.15**	j	**0.084**	J+	**0.062**	J+
Dimethyl phthalate	ug/L	3	b	**0.081**	j	**0.086**	j	**0.11**	J+	**0.098**	j	0.021	U	**0.14**	J+	**0.04**	j	**1.6**		**0.17**	J+	**0.16**	J+
Di-n-octyl phthalate	ug/L	3	b	**0.21**		0.033	U	0.033	U	**0.17**	j	0.033	U	0.034	U	**0.17**	j	**0.092**	j	0.033	U	0.033	U
Polycyclic Aromatic Hydrocarbons (SW8270D-SIM/SW8270D*)																							
Benzo(a)anthracene	ug/L	0.0012	a	**0.013**	j	0.02	U	**0.0054**	j	**0.019**	j	0.02	U	0.003	U	**0.012**	j	0.02	U	**0.0054**	J+	0.003	U
Benzo(a)pyrene	ug/L	0.00012	a	**0.02**	j	0.0011	U	**0.0081**	j	**0.017**	j	0.0011	U	0.0049	U	**0.017**	j	**0.0036**	j	**0.0087**	j	**0.0051**	j
Benzo(b)fluoranthene	ug/L	0.0012	a	**0.033**		0.00083	U	**0.011**	j	**0.029**		0.00083	U	0.0047	U	**0.029**		**0.0033**	j	**0.01**	j	**0.0056**	j
Chrysene	ug/L	0.0013	a	**0.026**		0.00076	U	**0.0094**	j	**0.029**		0.00076	U	0.0039	U	**0.021**	j	**0.0033**	j	**0.0086**	J+	**0.0061**	j
Fluoranthene	ug/L	0.2	b	**0.06**		**0.0023**	j	**0.023**		**0.076**		0.00082	U	0.012	U	**0.06**		**0.016**	j	**0.03**		**0.02**	j
Indeno(1,2,3-cd)pyrene	ug/L	0.0012	a	**0.018**	j	0.00089	U	**0.0069**	j	**0.013**	j	0.00089	U	0.003	U	**0.014**	j	**0.0024**	J+	**0.0065**	j	**0.0038**	j
Pyrene	ug/L	0.2	b	**0.079**		**0.0039**	j	**0.032**		**0.052**		0.001	U	0.006	U	**0.096**		**0.025**		**0.043**		**0.032**	
Total PAHs	ug/L	--		**0.249**		**0.0062**		**0.0958**		**0.235**		0		0		**0.249**		**0.0536**		**0.1122**		**0.0726**	
General Chemistry																							
Field pH	pH units	--		6.9		6.5		8.3		7.4		7.9		7.5		8.0		7.3		7.5			
Total Suspended Solids	ug/L	--		**57500**		5000	U	**31500**		**18000**		5000	U	**10000**		**27500**		**16500**		**18000**		**21500**	

Constituent	Unit	Screening Level	Source	Catch Basin (CB-6A)						Drain (E-1)						Manhole (STM-1)							
				2/14/2019		3/13/2020		9/23/2020		2/14/2019		3/13/2020		9/23/2020		2/14/2019		3/13/2020		3/13/2020 - DUP		9/23/2020	
Metals (SW6020)																							
Arsenic	ug/L	0.018	a	**0.19**	j	**0.37**	j	**0.39**	j	**0.53**		**1.01**		**0.53**		**0.26**	j	**0.4**	j	**0.38**	j	**0.52**	
Cadmium	ug/L	0.094	b	**0.052**		**0.1**		**0.075**		**0.054**		**0.167**		**0.047**		**0.079**		**0.15**		**0.135**		**0.106**	
Copper	ug/L	2.74	a	**3.58**		**4.19**		**9.22**		**4.69**		**14.7**		**7.16**		**4.11**		**13.0**		**14.8**		**12.9**	
Lead	ug/L	0.54	b	**1.87**		**0.41**		**3.15**		**3.22**		**6.83**		**1.58**		**1.91**		**1.44**		**1.22**		**1.28**	
Manganese	ug/L	100	a	**16.8**		**58.1**		**34.1**		**9.86**		**18.0**		**14.1**		**8.83**		**56.2**		**50.9**		**48.6**	
Nickel	ug/L	16	b	**0.71**		**0.98**		**1.46**		**1.84**		**2.80**		**1.35**		**0.84**		**5.75**		**6.59**		**2.96**	
Zinc	ug/L	36.5	a	**215**		**92.1**		**143**		**90.9**		**295**		**60.9**		**92.5**		**156**		**160**		**106**	
PCB Aroclors (SW8082)																							
Aroclor 1016	ug/L	0.96	b	0.0032	U	0.0032	UJ	0.0064	U	0.0032	U	0.0032	U	0.0064	U	0.0032	U	0.0032	U	0.0032	U	0.0064	U
Aroclor 1221	ug/L	0.034	b	0.0032	U	0.0032	UJ	0.0064	U	0.0032	U	0.0032	U	0.0064	U	0.0032	U	0.0032	U	0.0032	U	0.0064	U
Aroclor 1232	ug/L	0.034	b	0.0032	U	0.0032	UJ	0.0064	U	0.0032	U	0.0032	U	0.0064	U	0.0032	U	0.0032	U	0.0032	U	0.0064	U
Aroclor 1242	ug/L	0.034	b	0.0032	U	0.0032	UJ	0.0064	U	0.0032	U	0.0032	U	0.0064	U	0.0032	U	0.0032	U	0.0032	U	0.0064	U
Aroclor 1248	ug/L	0.034	b	0.0032	U	0.0032	UJ	0.0064	U	0.0032	U	0.0032	U	0.0064	U	0.0032	U	0.0032	U	0.0032	U	0.0064	U
Aroclor 1254	ug/L	0.033	b	0.0032	U	0.0032	UJ	0.0064	U	0.021	U	0.0032	U	0.0064	U	0.0032	U	0.0032	U	0.0032	U	0.0064	U
Aroclor 1260	ug/L	0.034	b	0.0042	U	0.0032	UJ	0.0064	U	0.029	U	0.0032	U	0.0064	U	0.012	U	0.0032	U	0.0032	U	0.0064	U
Aroclor 1262	ug/L	--		0.0036	U	0.0032	UJ	0.0064	U	0.024	U	0.0032	U	0.0064	U	0.012	U	0.0032	U	0.0032	U	0.0064	U
Aroclor 1268	ug/L	--		0.0032	U	0.0032	UJ	0.0064	U	0.017	U	**0.079**		0.0064	U	0.0095	U	**0.038**		**0.037**		0.0064	U
Total PCB Aroclors	ug/L	0.0000064	a	0.0042	U	0.0032	U	0.0064	U	0.029	U	**0.079**		0.0064	U	0.012	U	**0.038**		**0.037**		0.0064	U
Organochlorine Pesticides (SW8081B)																							
4,4'-DDD	ug/L	3.10E-05	b	0.0012	U	0.00057	U	0.00057	U	0.0012	U	0.0011	U	**0.0022**	J	0.0012	U	0.00057	U	**0.00075**	j	0.00057	U
4,4'-DDE	ug/L	1.80E-05	b	0.00092	U	0.00046	U	0.00097	U	0.0014	U	**0.00058**	J	**0.0012**		0.0012	U	0.00046	U	0.00046	U	0.00046	U
4,4'-DDT	ug/L	2.20E-05	b	0.0051	U	0.0056	U	0.00075	U	0.023	U	0.0057	U	**0.011**		0.023	U	0.0036	U	0.0076	U	**0.077**	
Dieldrin	ug/L	5.40E-06	b	0.00088	U	0.00044	U	0.00044	U	0.00088	U	0.00044	U	**0.00057**	j	0.00088	U	0.00044	U	0.00074	U	0.00044	U
Heptachlor epoxide	ug/L	3.90E-06	b	0.00058	U	0.0011	U	0.00029	U	0.00058	U	0.001	U	0.00037	U	0.00058	U	**0.00097**	J	**0.0012**		**0.00058**	J
Volatile Organic Compounds (SW8260C)																							
Chloroform	ug/L	0.17	b	0.072	U	0.072	U	0.072	U	0.072	U	**0.16**	j	0.072	U	0.072	U	0.072	U	0.072	U	0.072	U
Tetrachloroethene (PCE)	ug/L	0.12	b	0.099	U	0.099	U	0.099	U	**0.49**	j	0.099	U	**0.16**	j	**4.7**		0.099	U	0.099	U	**26**	
Trichloroethene (TCE)	ug/L	0.17	b	0.1	U	0.1	U	0.1	U	**0.62**		0.1	U	**0.14**	j	**3.2**		0.1	U	0.1	U	**27**	
Vinyl Chloride	ug/L	0.015	b	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U	0.075	U
Phthalate Esters (SW8270D)																							
Bis(2-ethylhexyl)phthalate	ug/L	0.2	a	**0.27**	j	0.13	U	0.99	U	**0.65**	j	**0.87**	j	1	U	**0.99**		**0.76**	j	**0.44**	j	0.94	U
Butylbenzylphthalate	ug/L	3	b	**0.040**	j	0.021	U	0.021	U	**0.056**	j	0.021	U	0.021	U	**0.067**	j	0.022	U	0.021	U	0.021	U
Dibutyl phthalate	ug/L	3	b	0.19	U	**0.059**	j	0.2	U	**0.61**		**0.39**		**0.48**		**0.63**		**0.3**		**0.29**		**0.54**	
Diethyl phthalate	ug/L	3	b	**0.13**	j	0.015	U	**0.045**	J+	**0.18**	j	**0.12**	j	**0.051**	J+	**0.33**		**0.082**	j	**0.081**	j	**0.078**	J+
Dimethyl phthalate	ug/L	3	b	**0.033**	j	**0.18**	j	**0.068**	J+	**0.059**	j	**1.9**		**0.049**	J+	**0.077**	j	**0.87**		**1.1**		**0.14**	J+
Di-n-octyl phthalate	ug/L	3	b	0.033	U	0.033	U	0.033	U	**0.15**	j	0.033	U	0.033	U	0.033	U	0.034	U	0.033	U	0.033	U
Polycyclic Aromatic Hydrocarbons (SW8270D-SIM/SW8270D*)																							
Benzo(a)anthracene	ug/L	0.0012	a	**0.018**	j	0.02	U	**0.0051**	j	**0.037**		0.02	U	**0.012**	J+	**0.0043**	j	0.02	U	0.02	U	0.003	U
Benzo(a)pyrene	ug/L	0.00012	a	**0.029**		0.0011	U	**0.012**	j	**0.048**		**0.0026**	j	**0.0096**	j	0.0047	U	**0.0022**	j	**0.0012**	j	0.0049	U
Benzo(b)fluoranthene	ug/L	0.0012	a	**0.039**		0.00083	U	**0.01**	j	**0.088**		**0.003**	j	**0.015**	j	**0.0091**	j	**0.0016**	j	0.00083	U	0.0047	U
Chrysene	ug/L	0.0013	a	**0.031**		0.00076	U	**0.0088**	j	**0.037**		**0.0036**	j	**0.01**	j	**0.0048**	j	**0.0016**	j	**0.0016**	j	0.0039	U
Fluoranthene	ug/L	0.2	b	**0.041**		**0.0026**	j	**0.021**	j	**0.15**		**0.018**	j	**0.036**		**0.021**		**0.0055**	j	**0.0056**	j	0.012	U
Indeno(1,2,3-cd)pyrene	ug/L	0.0012	a	**0.023**		0.00089	U	**0.0066**	j	**0.046**		**0.0015**	J+	**0.0076**	j	**0.0043**	j	**0.001**	J+	**0.00093**	J+	0.003	U
Pyrene	ug/L	0.2	b	**0.042**		**0.0034**	j	**0.026**		**0.087**		**0.024**		**0.026**		**0.024**		**0.0096**	j	**0.0092**	j	**0.013**	j
Total PAHs	ug/L	--		**0.223**		**0.006**		**0.0895**		**0.493**		**0.0527**		**0.1162**		**0.0675**		**0.0215**		**0.01853**		**0.013**	
General Chemistry																							
Field pH	pH units	--		7.4						6.7		6.8		8.3		7.8		8.5				7.8	
Total Suspended Solids	ug/L	--		**14000**		5000	U	**32500**		**19000**		**13500**		**11000**		**9000**		**7000**		**6500**		**7000**	

Notes:

Gray shading indicates compound concentration was greater than applicable JSCS SLV
Detected results shown in ***bold.***
-- = Not applicable
j = Result is detected between the method detection limit and reporting limit
J = Result is estimated
J+ = Result is estimated with
U = Analyte not detected
UJ = Result is estimated to be not detected
µg/L = micrograms per liter
CUL = Clean up level
DEQ = Department of Environmental Quality
EPA = Environmental Protection Agency
JSCS = Joint Source Control Strategy
PAHs = Polyaromatic Hydrocarbons
cPAH (BaPeq) = carcinogenic PAHs calculated as benzo(a)pyrene equivalent
PCBs = Polychlorinated biphenyls
ROD = Record of Decision
SLVs = Screening level values
SU = standard units
VOCs = volatile organic compounds
Total PCBs Aroclors is sum of PCB aroclors which were detected above the detection limit, with non-detects counted as zero. Detection limits are recorded as the highest detection limit of the individual aroclors.
** = Samples collected in February 2020 analyzed by SW8270D. Samples collected in 2020 analyzed by SW8270D-SIM*

Screening Level Footnotes:
a = Portland Harbor ROD CUL for Surface Water
b = Portland Harbor JSCS SLV

Table 10
Stormwater Exceedance Quotients
Stormwater Source Control Effectiveness Evaluation
Univar Solutions USA Inc.

Constituent	Unit	Screening Level	Source	Catch Basin (CB-2E)			Catch Basin (CB-4A)			Catch Basin (CB-5A)				Catch Basin (CB-6A)			Drain (E-1)			Manhole (STM-1)			
				2/14/2019	3/13/2020	9/23/2020	2/14/2019	3/13/2020	9/23/2020	2/14/2019	3/13/2020	9/23/2020	9/23/2020 - DUP	2/14/2019	3/13/2020	9/23/2020	2/14/2019	3/13/2020	9/23/2020	2/14/2019	3/13/2020	3/13/2020 - DUP	9/23/2020
Metals (SW6020)																							
Arsenic	ug/L	0.018	a	**61.1**	**22.2**	**35.0**	**27.2**	**16.7**	**27.2**	**10.0**	**17.8**	**23.9**	**21.7**	**10.6**	**20.6**	**21.7**	**29.4**	**56.1**	**29.4**	**14.4**	**22.2**	**21.1**	**28.9**
Cadmium	ug/L	0.094	b	**2.8**	**1.2**	**1.4**	**1.6**	**0.8**	**1.7**	**0.7**	**0.7**	**0.8**	**0.7**	**0.6**	**1.1**	**0.8**	**0.6**	**1.8**	**0.5**	**0.8**	**1.6**	**1.4**	**1.1**
Copper	ug/L	2.74	a	**3.8**	**2.3**	**2.7**	**1.7**	**1.5**	**3.5**	**1.5**	**4.3**	**4.8**	**4.8**	**1.3**	**1.5**	**3.4**	**1.7**	**5.4**	**2.6**	**1.5**	**4.7**	**5.4**	**4.7**
Lead	ug/L	0.54	b	**22.0**	**0.9**	**4.3**	**12.8**	**0.4**	**2.1**	**3.6**	**2.8**	**3.0**	**2.9**	**3.5**	**0.8**	**5.8**	**6.0**	**12.6**	**2.9**	**3.5**	**2.7**	**2.3**	**2.4**
Manganese	ug/L	100	a	**0.5**	**0.1**	**0.1**	**0.2**	**0.3**	**0.5**	**0.2**	**0.2**	**0.3**	**0.2**	**0.2**	**0.6**	**0.3**	**0.1**	**0.2**	**0.1**	**0.1**	**0.6**	**0.5**	**0.5**
Nickel	ug/L	16	b	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.2**	**0.1**	**0.1**	**0.1**	**0.1**	**0.0**	**0.1**	**0.1**	**0.1**	**0.2**	**0.1**	**0.1**	**0.4**	**0.4**	**0.2**
Zinc	ug/L	36.5	a	**7.3**	**3.5**	**2.4**	**8.5**	**4.2**	**9.5**	**1.9**	**3.3**	**3.7**	**3.6**	**5.9**	**2.5**	**3.9**	**2.5**	**8.1**	**1.7**	**2.5**	**4.3**	**4.4**	**2.9**
PCB Aroclors (SW8082)																							
Aroclor 1016	ug/L	0.96	b	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aroclor 1221	ug/L	0.034	b	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aroclor 1232	ug/L	0.034	b	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aroclor 1242	ug/L	0.034	b	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aroclor 1248	ug/L	0.034	b	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aroclor 1254	ug/L	0.033	b	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aroclor 1260	ug/L	0.034	b	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aroclor 1262	ug/L	--		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aroclor 1268	ug/L	--		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total PCB Aroclors	ug/L	0.0000064	a	-	**2188**	-	-	-	-	-	**969**	-	-	-	-	-	-	**12344**	-	-	**5938**	**5781**	-
Organochlorine Pesticides (SW8081B)																							
4,4'-DDD	ug/L	3.10E-05	b	-	**35**	**21**	-	-	-	-	-	**26**	**26**	-	-	-	-	-	**71**	-	-	**24**	-
4,4'-DDE	ug/L	1.80E-05	b	-	-	**100**	-	-	-	**53**	-	**67**	-	-	-	-	-	**32**	**67**	-	-	-	-
4,4-DDT	ug/L	2.20E-05	b	-	-	**1591**	-	-	**20000**	-	-	-	**182**	-	-	-	-	-	**500**	-	-	-	**3500**
Dieldrin	ug/L	5.40E-06	b	-	-	-	-	-	-	-	-	**167**	-	-	-	-	-	-	**106**	-	-	-	-
Heptachlor epoxide	ug/L	3.90E-06	b	-	**215**	-	-	-	-	-	-	**108**	-	-	-	-	-	-	-	-	**249**	**308**	**149**
Volatile Organic Compounds (SW8260C)																							
Chloroform	ug/L	0.17	b	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0.9**	-	-	-	-	-
Tetrachloroethene (PCE)	ug/L	0.12	b	-	-	-	-	-	**1.0**	-	-	-	**0.8**	-	-	-	**4.1**	-	**1.3**	**39.2**	-	-	**217**
Trichloroethene (TCE)	ug/L	0.17	b	-	-	-	-	-	-	-	-	-	-	-	-	-	**3.6**	-	**0.8**	**18.8**	-	-	**159**
Vinyl Chloride	ug/L	0.015	b	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phthalate Esters (SW8270D)																							
Bis(2-ethylhexyl)phthalate	ug/L	0.2	a	**18.5**	**2.5**	**9.0**	**17.5**	**1.0**	-	**2.7**	**2.0**	-	-	**1.4**	-	-	**3.3**	**4.4**	-	**5.0**	**3.8**	**2.2**	-
Butylbenzylphthalate	ug/L	3	b	**0.1**	-	**0.1**	**0.0**	**0.0**	-	**0.0**	-	-	-	**0.0**	-	-	**0.0**	-	-	**0.0**	-	-	-
Dibutyl phthalate	ug/L	3	b	**0.0**	**0.0**	-	**0.0**	**0.0**	-	**0.0**	**0.1**	-	-	-	**0.0**	-	**0.2**	**0.1**	**0.2**	**0.2**	**0.1**	**0.1**	**0.2**
Diethyl phthalate	ug/L	3	b	**0.1**	**0.0**	**0.0**	**0.1**	-	**0.0**	**0.0**	**0.1**	**0.0**	**0.0**	**0.0**	-	**0.0**	**0.1**	**0.0**	**0.0**	**0.1**	**0.0**	**0.0**	**0.0**
Dimethyl phthalate	ug/L	3	b	**0.0**	-	**0.0**	**0.0**	-	**0.0**	**0.0**	**0.5**	**0.1**	**0.1**	**0.0**	**0.1**	**0.0**	**0.0**	**0.6**	**0.0**	**0.0**	**0.3**	**0.4**	**0.0**
Di-n-octyl phthalate	ug/L	3	b	**0.1**	-	-	**0.1**	-	-	**0.1**	**0.0**	-	-	-	-	-	**0.1**	-	-	-	-	-	-
Polycyclic Aromatic Hydrocarbons (SW8270D-SIM/SW8270D*)																							
Benzo(a)anthracene	ug/L	0.0012	a	**10.8**	-	**4.5**	**15.8**	-	-	**10.0**	-	**4.5**	-	**15.0**	-	**4.3**	**30.8**	-	**10.0**	**3.6**	-	-	-
Benzo(a)pyrene	ug/L	0.00012	a	**167**	-	**67.5**	**142**	-	-	**142**	**30.0**	**72.5**	**42.5**	**242**	-	**100**	**400**	**21.7**	**80.0**	-	**18.3**	**10.0**	-
Benzo(b)fluoranthene	ug/L	0.0012	a	**27.5**	-	**9.2**	**24.2**	-	-	**24.2**	**2.8**	**8.3**	**4.7**	**32.5**	-	**8.3**	**73.3**	**2.5**	**12.5**	**7.6**	**1.3**	-	-
Chrysene	ug/L	0.0013	a	**20.0**	-	**7.2**	**22.3**	-	-	**16.2**	**2.5**	**6.6**	**4.7**	**23.8**	-	**6.8**	**28.5**	**2.8**	**7.7**	**3.7**	**1.2**	**1.2**	-
Fluoranthene	ug/L	0.2	b	**0.3**	**0.0**	**0.1**	**0.4**	-	-	**0.3**	**0.1**	**0.2**	**0.1**	**0.2**	**0.0**	**0.1**	**0.8**	**0.1**	**0.2**	**0.1**	**0.0**	**0.0**	-
Indeno(1,2,3-cd)pyrene	ug/L	0.0012	a	**15.0**	-	**5.8**	**10.8**	-	-	**11.7**	**2.0**	**5.4**	**3.2**	**19.2**	-	**5.5**	**38.3**	**1.3**	**6.3**	**3.6**	**0.8**	**0.8**	-
Pyrene	ug/L	0.2	b	**0.4**	**0.0**	**0.2**	**0.3**	-	-	**0.5**	**0.1**	**0.2**	**0.2**	**0.2**	**0.0**	**0.1**	**0.4**	**0.1**	**0.1**	**0.1**	**0.0**	**0.0**	**0.1**
General Chemistry																							
pH	pH units	--		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Suspended Solids	ug/L	--		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

Indicates result concentration exceeds SLV by a factor between 1 and 10
Indicates result concentration exceeds SLV by a factor between 10 and 100
Indicates result concentration exceeds SLV by a factor greater than 100

Screening Level Footnotes:
a = Portland Harbor ROD CUL for Surface Water
b = Portland Harbor JSCS SLV

Detected results shown in ***bold.***
- = Not detected
-- = Not applicable
j = Result is detected between the method detection limit and reporting limit
J = Result is estimated
J+ = Result is estimated with a high bias
U = Analyte not detected
UJ = Result is estimated to be not detected
µg/L = micrograms per liter
CUL = Clean up level
DEQ = Department of Environmental Quality
EPA = Environmental Protection Agency
JSCS = Joint Source Control Strategy
PAHs = Polyaromatic Hydrocarbons
cPAH (BaPeq) = carcinogenic PAHs calculated as benzo(a)pyrene equivalent
PCBs = Polychlorinated biphenyls
ROD = Record of Decision
SLVs = Screening level values
SU = standard units
VOCs = volatile organic compounds
Total PCBs Aroclors is sum of PCB aroclors which were detected above the detection limit, with non-detects counted as zero. Detection limits are recorded as the highest detection limit of the individual aroclors.
** = Samples collected in February 2020 analyzed by SW8270D. Samples collected in 2020 analyzed by SW8270D-SIM*

Table 11
Summary of Screening Evaluation and Comparison to Heavy Industrial Sites
Stormwater Source Control Effectiveness Evaluation
Univar Solutions USA Inc.

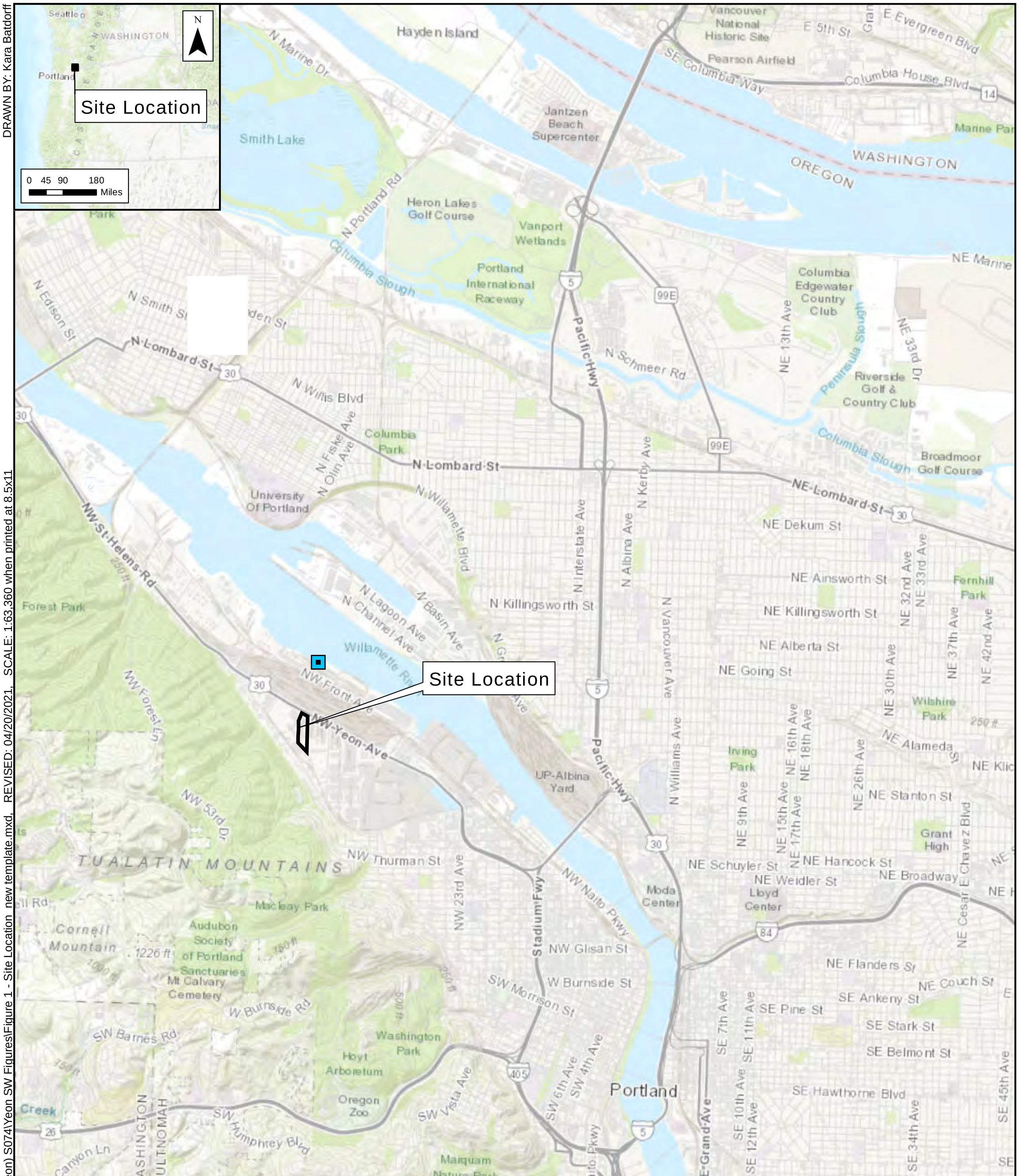
Analyte	Stormwater (February 2019, March 2020, September 2020)						Proposed Additional Source Control Action
	CUL or SLV Exceedance[3]			Above flat part of curve[4]			
	1 of 3	2 of 3	3 of 3	1 of 3	2 of 3	3 of 3	
Arsenic	CB-2E, CB-4A, CB-5A, CB-6A, E-1, STM-1	CB-2E, CB-4A, CB-5A, CB-6A, E-1, STM-1	CB-2E, CB-4A, CB-5A, CB-6A, E-1, STM-1	-	-	-	None, analyte is considered low risk.
Cadmium	CB-2E, CB-4A	CB-2E, CB-6A, E-1, STM-1	CB-2E, CB-4A, STM-1	-	-	-	None, analyte is considered low risk.
Chromium	NS						None, analyte is considered low risk.
Copper	CB-2E, CB-4A, CB-5A, CB-6A, E-1, STM-1	CB-2E, CB-4A, CB-5A, CB-6A, E-1, STM-1	CB-2E, CB-4A, CB-5A, CB-6A, E-1, STM-1	-	-	-	None, analyte is considered low risk.
Lead	CB-2E, CB-4A, CB-5A, CB-6A, E-1, STM-1	CB-5A, E-1, STM-1	CB-2E, CB-4A, CB-5A, CB-6A, E-1, STM-1	-	-	-	None, analyte is considered low risk.
Manganese	-	-	-	-	-	-	None, analyte is considered low risk.
Mercury	NS						None, analyte is considered low risk.
Nickel	-	-	-	-	-	-	None, analyte is considered low risk.
Zinc	CB-2E, CB-4A, CB-5A, CB-6A, E-1, STM-1	CB-2E, CB-4A, CB-5A, CB-6A, E-1, STM-1	CB-2E, CB-4A, CB-5A, CB-6A, E-1, STM-1	-	-	-	Ongoing monitoring and management will be completed under the 1200-Z Permit.
PCBs	-	CB-2E, CB-5A, E-1, STM-1	-	-	-	-	None, analyte is considered low risk.
DDx	-	CB-2E, E-1, STM-1	CB-2E, CB-4A, CB-5A, E-1, STM-1	NA			Implement a CMMP for soil disturbing activities at the Property.

Table 11
Summary of Screening Evaluation and Comparison to Heavy Industrial Sites
Stormwater Source Control Effectiveness Evaluation
Univar Solutions USA Inc.

Analyte	Stormwater (February 2019, March 2020, September 2020)						Proposed Additional Source Control Action
	CUL or SLV Exceedance[3]			Above flat part of curve[4]			
	1 of 3	2 of 3	3 of 3	1 of 3	2 of 3	3 of 3	
VOCs	CB-4A	E-1, STM-1	-	NA			Implement a CMMP for soil disturbing activities at the Property.
BEHP	CB-2E, CB-4A, CB-5A, CB-6A, E-1, STM-1	CB-2E, CB-4A, CB-5A, E-1, STM-1	CB-2E	-	-	-	None, analyte is considered low risk.
PAHs	CB-6A	CB-2E, CB-5A, E-1, STM-1	CB-5A, CB-6A, E-1	-	-	-	None, analyte is considered low risk.
TSS	NA	NA	NA	CB-2E	-	-	Ongoing monitoring and management will be completed under the 1200-Z Permit.

Notes:
BEHP = bis(2-Ethylhexyl)phthalate
CMMP = Contaminated Media Management Plan
CUL = cleanup level
DEQ = Department of Environmental Quality
EPA = Environmental Protection Agency
JSCS = Joint Source Control Strategy
PCBs = Polychlorinated biphenyls
ROD = Record of Decision
SLVs = Screening level values
TSS = total suspended solids
[1] = Samples locations CB-3D and Roof-2 were sampled during three of four storm events in March 2017, May 2017, and June 2017.
[2] = Development of Oregon Background Metals Concentrations in Soils. Technical Report. DEQ 2013
[3] = Screening levels are Portland Harbor ROD CULs (EPA 2017) supplemeneted with the highlighted screening levels in the Portland Harbor Joint Source Control Strategy, Final, Table 3-1 Revision, July 2007
[4] = DEQ Guidance for Evaluating the Stormwater Pathway at Upland Sites Appendix E: Tool for Evaluating Stormwater Data
NA = no curve and or SLV for this analyte
- = no location meet this criteria
NS = Not sampled

FIGURES



Legend

Outfall 18

Approximate Univar Property Boundary

N

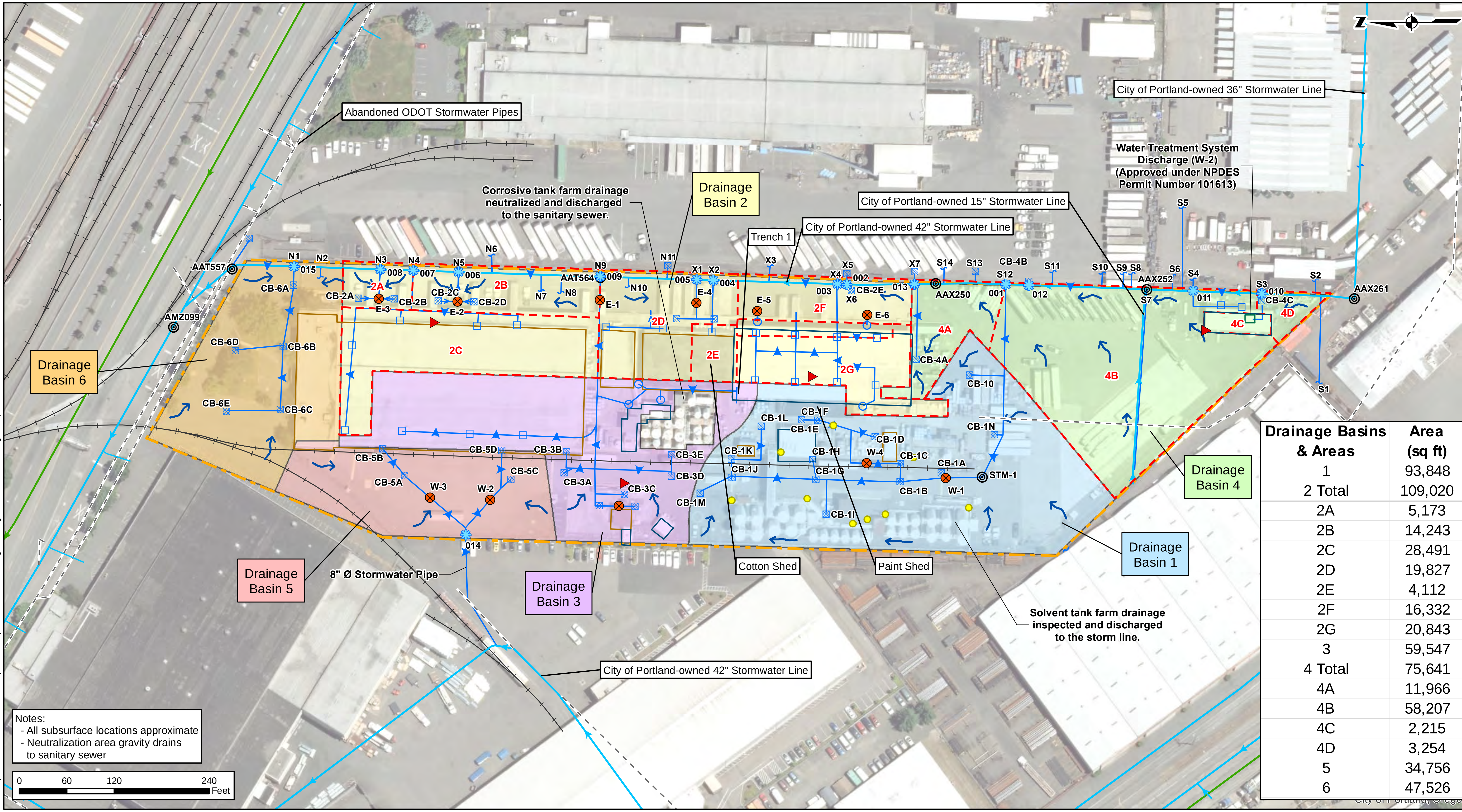
0 1 2

Miles

Figure 1
Site Location Map
Univar Solutions USA Inc.
NW Yeon Ave
Portland, Oregon

Environmental Resources Management
www.erm.com
ERM

Source: Esri - World Topoographic Map; NAD 1983 StatePlane Oregon North FIPS 3601 Feet



Drainage Basins & Areas	Area (sq ft)
1	93,848
2 Total	109,020
2A	5,173
2B	14,243
2C	28,491
2D	19,827
2E	4,112
2F	16,332
2G	20,843
3	59,547
4 Total	75,641
4A	11,966
4B	58,207
4C	2,215
4D	3,254
5	34,756
6	47,526

Aerial Image - City of Portland, 2017 - 0.5 ft per pixel.

Legend

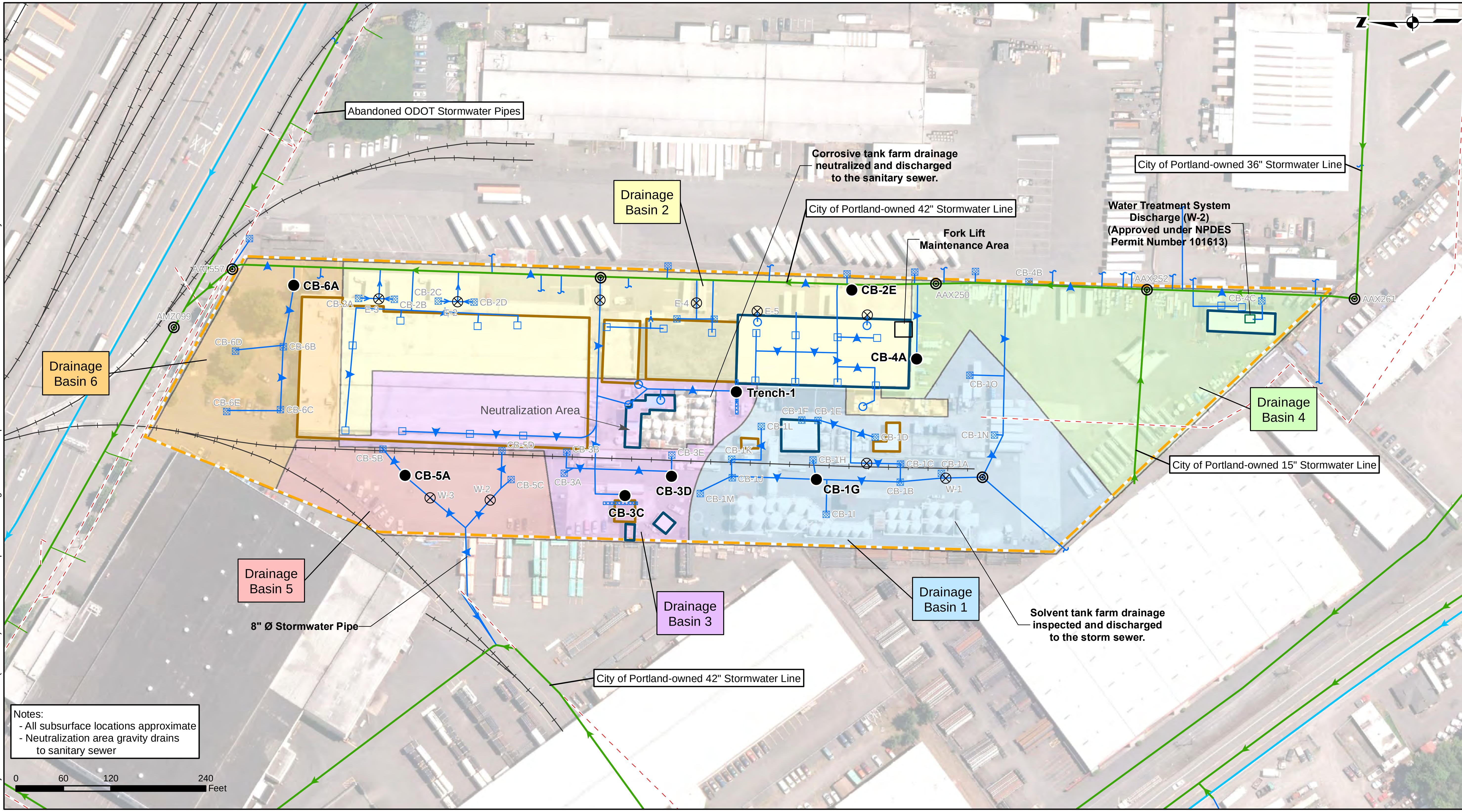
- Catch Basin
- Floor Drain
- Roof Drain
- Discharge Point
- SPCC Control Valve
- Storm Manhole
- Secondary Containment Discharge Location
- Spill Kit
- Railroad Track
- Approximate Univar Property Boundary
- Drainage Basin 1
- Drainage Basin 2
- Drainage Basin 3
- Drainage Basin 4
- Drainage Basin 5
- Drainage Basin 6
- Drainage Area
- Corrugated Metal Roof
- Tar or Asphalt Shingle Roof
- City Sanitary Sewer Pipes
- City Stormwater Pipe
- City Stormwater Laterals
- Abandoned Sewer Pipes
- Private Stormwater Pipe
- Generalized Surface Flow Direction

Figure 2

Site Drainage Plan Map
Univar Solutions USA Inc., NW Yeon Ave
Portland, Oregon

Environmental Resources Management
1050 SW 6th Ave, Suite 1650
Portland, Oregon 97204
ERM

M:\Projects\Univar\Portland OR (NW Yeon) S074\SWSCE Report 201708\Figure 4 - CBSampleLocs.mxd Created By: Kara Batdorff Date: 8/25/2017 Project: 0380575



Legend

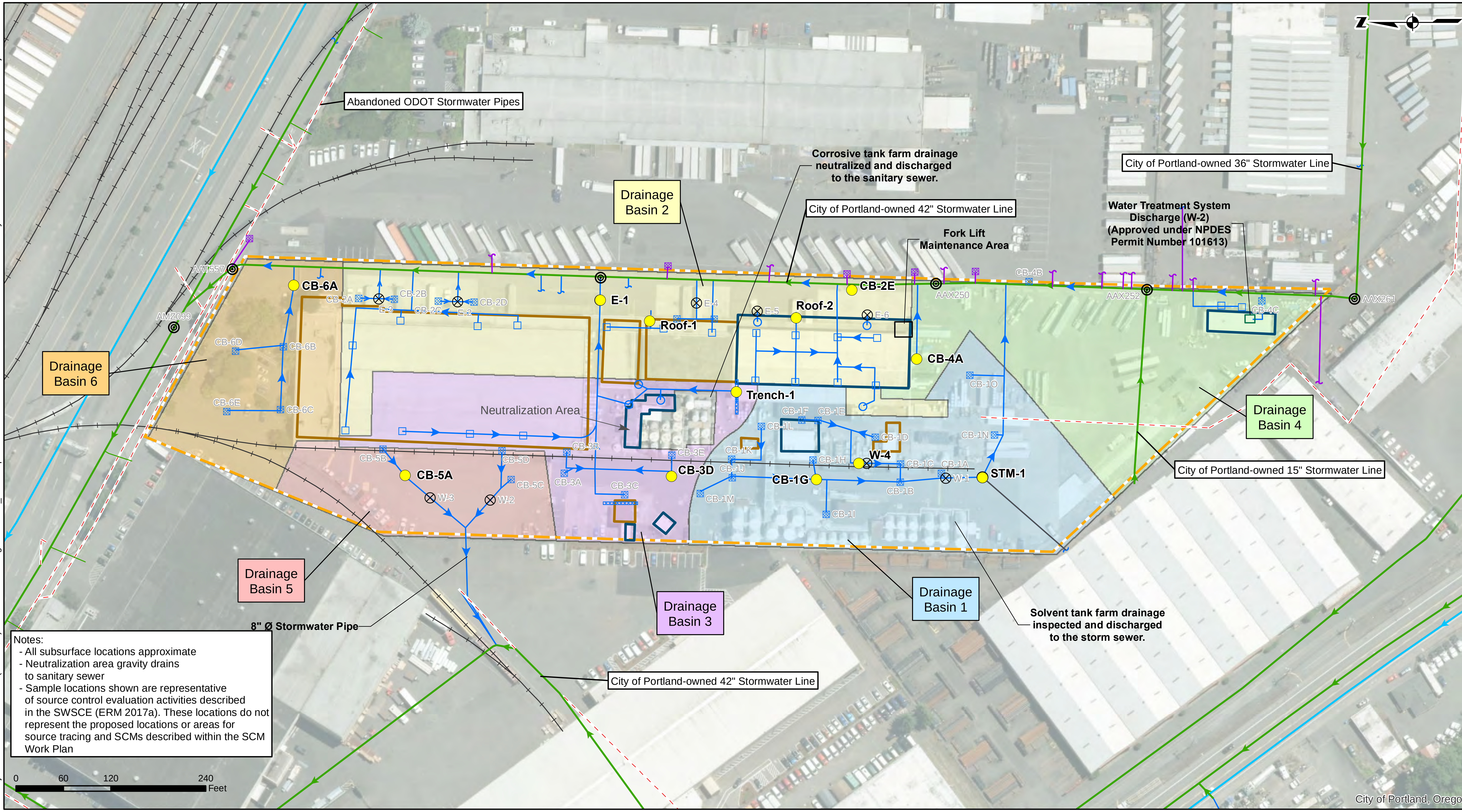
- Catch Basin Solids Sample Location
- Catch Basin
- Floor Drain
- Roof Drain
- SPCC Control Valve
- Storm Manhole
- Railroad Track
- Approximate Univar Property Boundary
- Drainage Basin 1
- Drainage Basin 2
- Drainage Basin 3
- Drainage Basin 4
- Drainage Basin 5
- Drainage Basin 6
- City Sanitary Sewer Pipes
- City Stormwater Pipe
- Abandoned Sewer Pipes
- City Storm Laterals
- Private Stormwater Pipe
- Corrugated Metal Roof
- Tar or Asphalt Shingle Roof

Aerial Image - USGS State Orthoimagery, July 2012, 0.5 ft per pixel.

Figure 3

Catch Basin Solids Sample Location Map
Univar Solutions USA Inc., NW Yeon Ave
Portland, Oregon

Environmental Resources Management
1001 SW 5th St, Suite 1010
Portland, Oregon 97204
ERM.



M:\Projects\Univar\Portland OR (NW Yeon) S074\Work Plan\Figure 4 - SW_GWSampleLocs.mxd Created By: Kara Batdorff Date: 7/17/2018 Project: 0380575

Legend

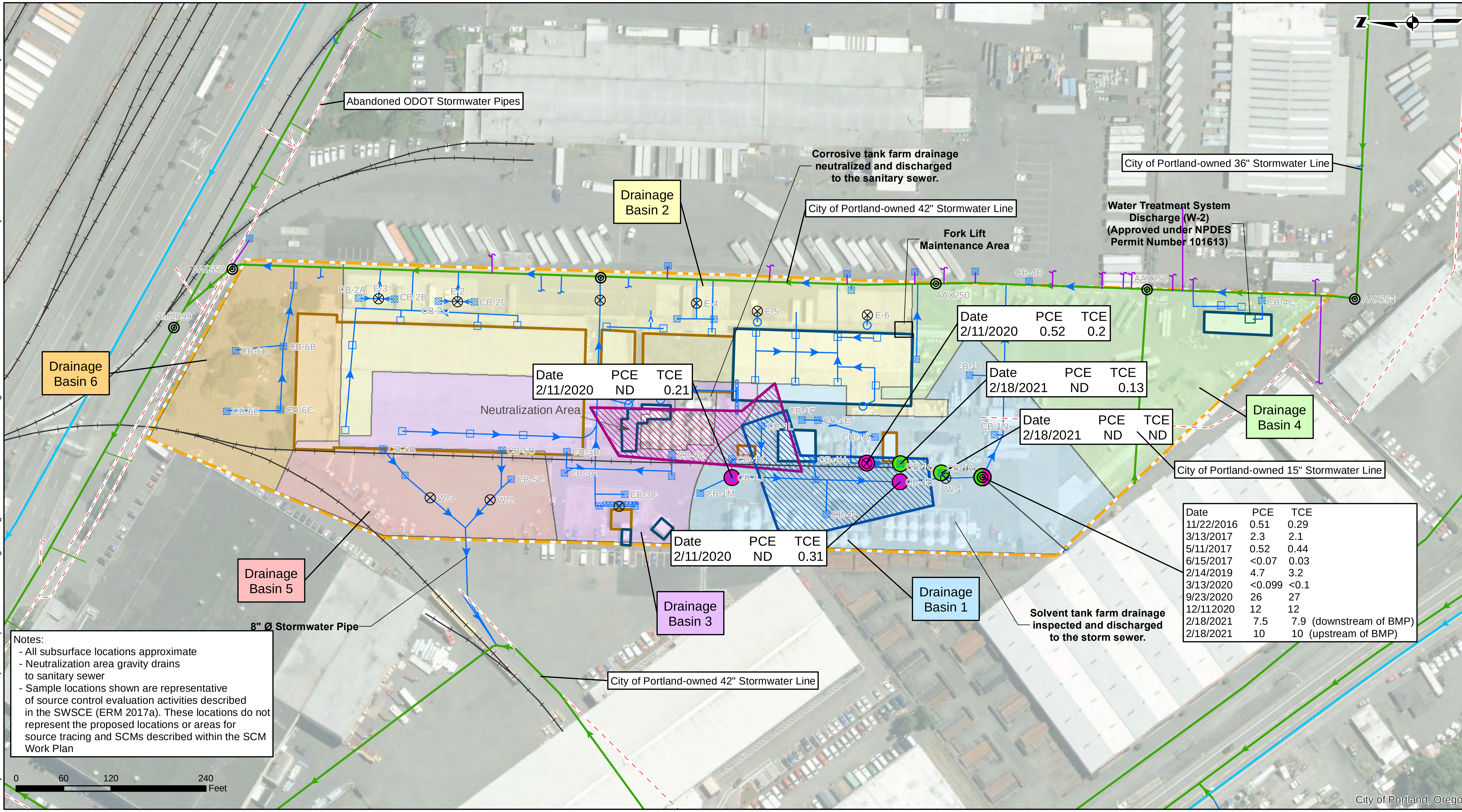
- Catch Basin
- Floor Drain
- Roof Drain
- SPCC Control Valve
- Storm Manhole
- Railroad Track
- Stormwater Sample Location
- Approximate Univar Property Boundary
- Drainage Basin 1
- Drainage Basin 2
- Drainage Basin 3
- Drainage Basin 4
- Drainage Basin 5
- Drainage Basin 6
- City Sanitary Sewer Pipes
- City Stormwater Pipe
- Abandoned Sewer Pipes
- City Storm Laterals
- Private Stormwater Pipe
- Private Stormwater Pipe (off-site)
- Abandoned Stormwater Pipe (No Flow)
- Corrugated Metal Roof
- Tar or Asphalt Shingle Roof

Aerial Image - USGS State Orthoimagery, July 2012, 0.5 ft per pixel.

Figure 4

Stormwater and Groundwater Infiltration Sample Location Map
Univar USA Inc., NW Yeon Ave
Portland, Oregon

Environmental Resources Management
1001 SW 5th St, Suite 1010
Portland, Oregon 97204
ERM.



Legend

- Catch Basin
- Floor Drain
- Roof Drain
- SPCC Control Valve
- Storm Manhole
- Railroad Track
- Approximate Univar Property Boundary
- Drainage Basin 1
- Drainage Basin 2
- Drainage Basin 3
- Drainage Basin 4
- Drainage Basin 5
- Drainage Basin 6
- December Sample Location for Additional Stormwater Samples for Analysis VOCs
- February Sample Location For additional Stormwater Samples for Analysis VOCs
- December and February Sample Location For additional Stormwater Samples for Analysis VOCs
- City Sanitary Sewer Pipes
- City Stormwater Pipe
- Abandoned Sewer Pipes
- City Storm Laterals
- Private Stormwater Pipe
- Private Stormwater Pipe (off-site)
- Abandoned Stormwater Pipe (No Flow)
- Corrugated Metal Roof
- Tar or Asphalt Shingle Roof
- North Source Area
- South Source Area

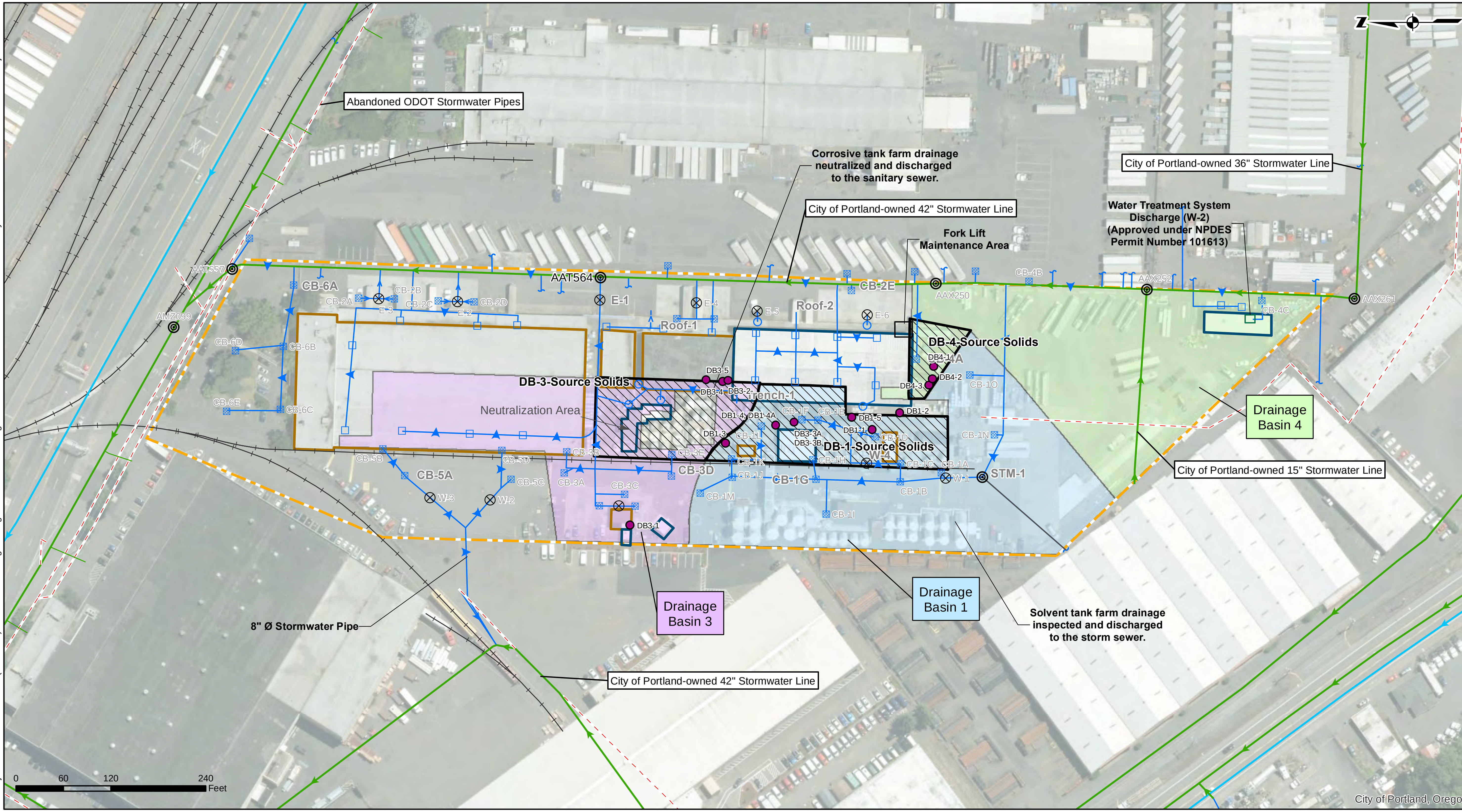
Aerial Image - City of Portland, 2017 - 0.5 ft per pixel.

Figure 5

Stormwater and Groundwater Infiltration SWSCEE Sample Location Map
Univar Solutions USA Inc., NW Yeon Ave
Portland, Oregon

Environmental Resources Management
1001 SW 5th St, Suite 1010
Portland, Oregon 97204
ERM

M:\Projects\Univar\Portland OR (NW Yeon) S074\Yeon SW Figures\Figure 6 - Source Tracing.mxd Created By: Kara Batdorff Date: 4/27/2021 Project: 0380575



Legend

- Source Tracing Solids Sample Location
- Catch Basin
- Floor Drain
- Roof Drain
- SPCC Control Valve
- Storm Manhole
- Railroad Track
- Approximate Univar Property Boundary
- Source Tracing Drainage Basins
  - Drainage Basin 1
  - Drainage Basin 3
  - Drainage Basin 4
- Wipe Sampling Areas
- City Sanitary Sewer Pipes
- City Stormwater Pipe
- Abandoned Sewer Pipes
- City Storm Laterals
- Private Stormwater Pipe
- Corrugated Metal Roof
- Tar or Asphalt Shingle Roof

Aerial Image - City of Portland, 2017 - 0.5 ft per pixel.

Figure 6

Source Tracing Location Map
Univar Solutions USA Inc.
NW Yeon Ave
Portland, Oregon

Environmental Resources Management
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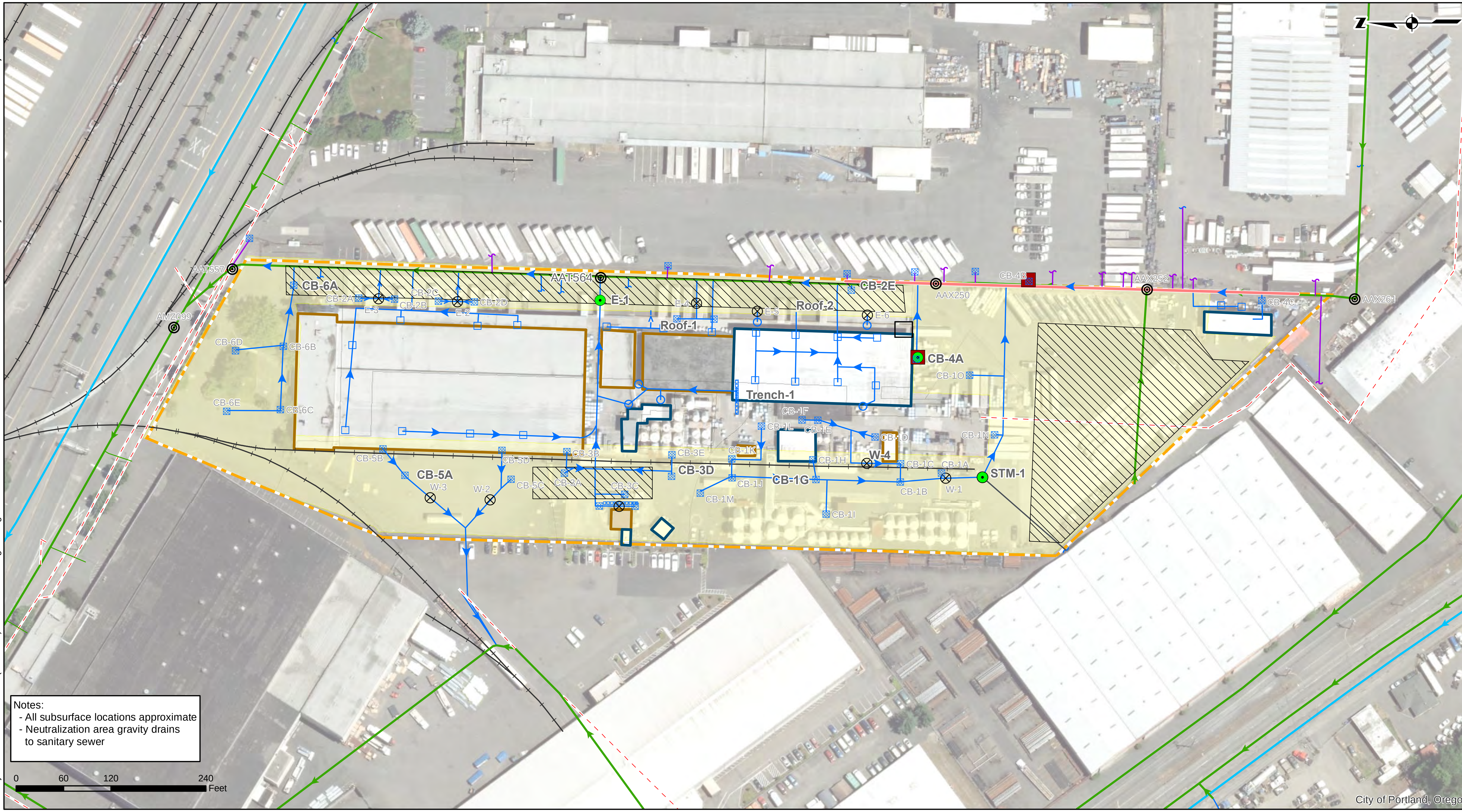
M:\Projects\Univar\Portland OR (NW Yeon) S074\Yeon SW Figures\Figure 7 - Source Control Measures.mxd Created By: Kara Batdorff Date: 5/6/2021 Project: 0380575



Legend

- Catch Basin
- Floor Drain
- Roof Drain
- SPCC Control Valve
- Storm Manhole
- Catch Basin Filter Media (Metalzorb)
- Catch Basin Filter Media (NOC Socks)
- Railroad Track
- Approximate Univar Property Boundary
- Drainage_Areas
- City Sanitary Sewer Pipes
- City Stormwater Pipe
- Abandoned Sewer Pipes
- City Storm Laterals
- Private Stormwater Pipe
- Private Stormwater Pipe (off-site)
- Abandoned Stormwater Pipe (No Flow)
- Corrugated Metal Roof
- Tar or Asphalt Shingle Roof
- Pavement Curbing
- Repaved - Concrete
- Street Sweeping

Aerial Image - USGS State Orthoimagery, Summer 2017, 0.5 ft per pixel.

Figure 7

Source Control Measures
Sample Location Map
Univar Solutions USA Inc., NW Yeon Ave
Portland, Oregon

Environmental Resources Management
1001 SW 5th St, Suite 1010
Portland, Oregon 97204
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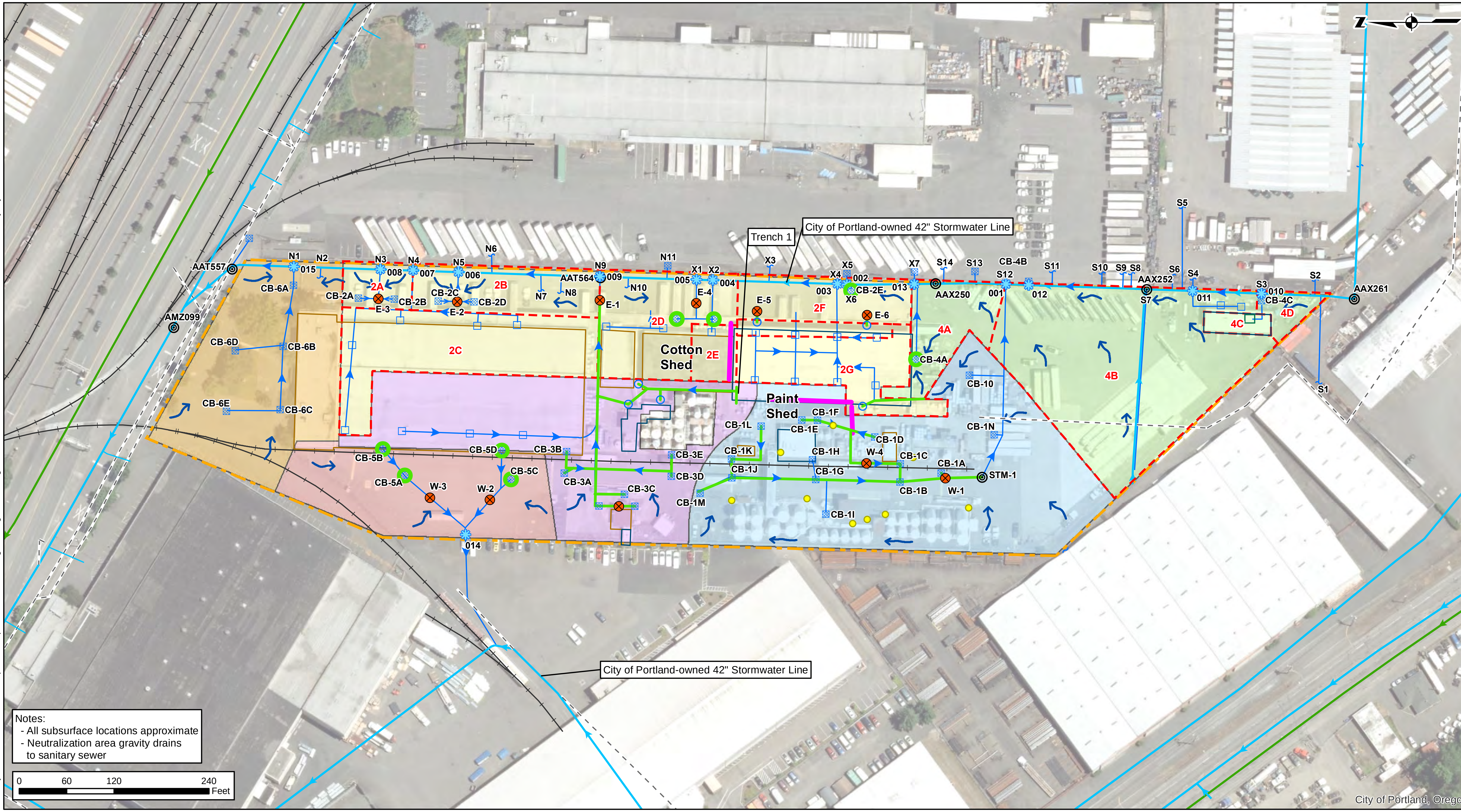


M:\Projects\Univar\Portland OR (NW Yeon) S074\Yeon SW Figures\Figure 8 - Targeted Source Removal.mxd Created By: Tyler Harris Date: 5/6/2021 Project: 0501333

Aerial Image - City of Portland, 2017 - 0.5 ft per pixel.

Legend

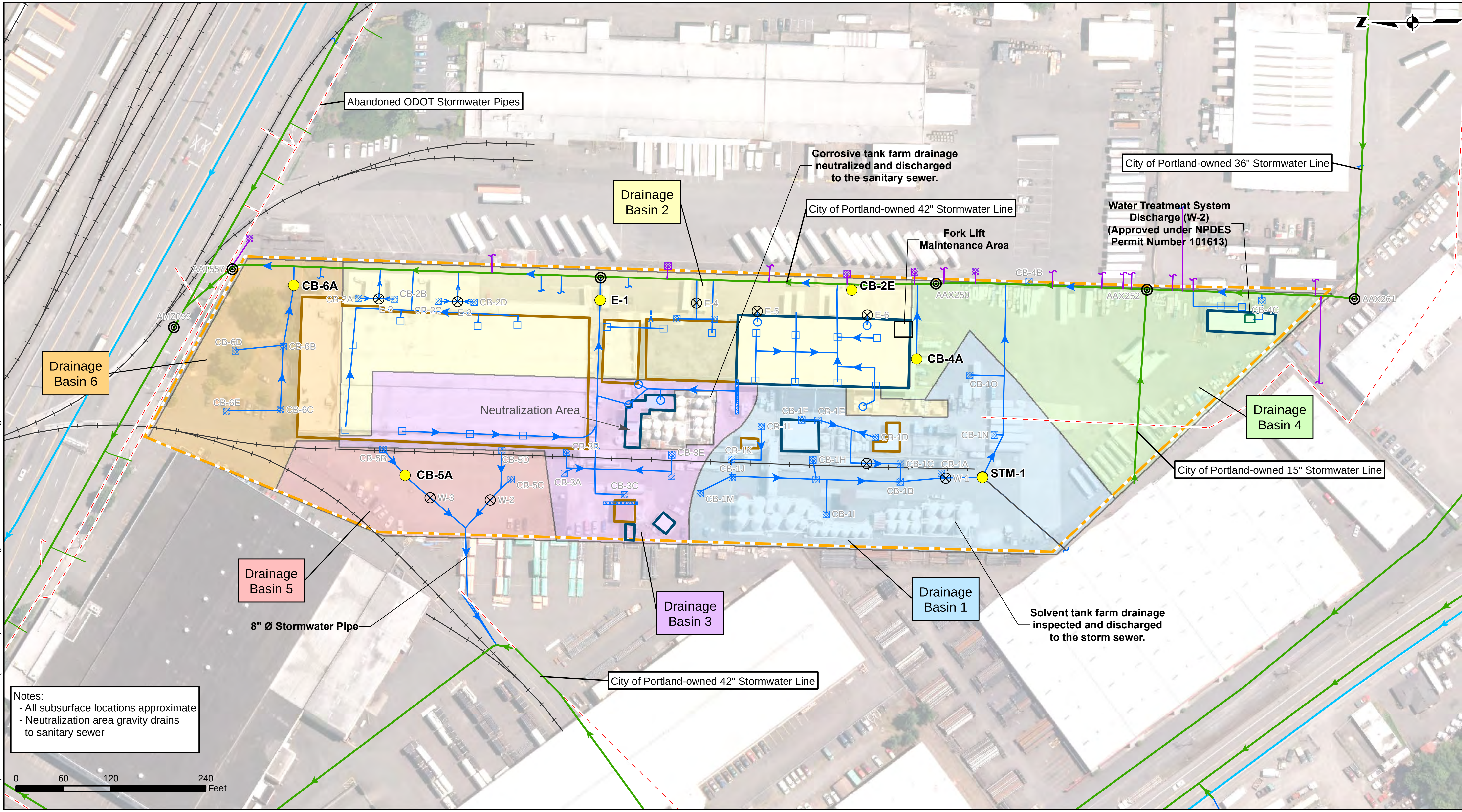
- Catch Basin
- Floor Drain
- Roof Drain
- Discharge Point
- SPCC Control Valve
- Storm Manhole
- Catch Basin to be Jetted where Line Jetting Requires Collection in COP-owned 42", main
- Railroad Track
- Approximate Univar Property Boundary
- Drainage Basin 1
- Drainage Basin 2
- Drainage Basin 3
- Drainage Basin 4
- Drainage Basin 5
- Drainage Basin 6
- Drainage Area
- Corrugated Metal Roof
- Tar or Asphalt Shingle Roof
- City Sanitary Sewer Pipes
- City Stormwater Pipe
- City Stormwater Laterals
- Abandoned Sewer Pipes
- Private Stormwater Pipe
- Generalized Surface Flow Direction
- PCB Composite Siding Removed
- Stormwater Line and Catch Basins Jetted

Figure 8

Targeted Source Removal
Univar Solutions USA Inc.
NW Yeon Ave
Portland, Oregon

Environmental Resources Management
1050 SW 6th Ave, Suite 1650
Portland, Oregon 97204
ERM

M:\Projects\Univar\Portland OR (NW Yeon) S074\Work Plan\Figure 7 - Performance Monitoring.mxd Created By: Kara Batdorff Date: 7/17/2018 Project: 0380575



Legend

- Catch Basin
- Floor Drain
- Roof Drain
- SPCC Control Valve
- Storm Manhole
- Railroad Track
- Stormwater Sample Location
- Approximate Univar Property Boundary
- Drainage Basin 1
- Drainage Basin 2
- Drainage Basin 3
- Drainage Basin 4
- Drainage Basin 5
- Drainage Basin 6
- City Sanitary Sewer Pipes
- City Stormwater Pipe
- Abandoned Sewer Pipes
- City Storm Laterals
- Private Stormwater Pipe
- Private Stormwater Pipe (off-site)
- Abandoned Stormwater Pipe (No Flow)
- Corrugated Metal Roof
- Tar or Asphalt Shingle Roof

Aerial Image - USGS State Orthoimagery, July 2012, 0.5 ft per pixel.

Figure 9

Performance Monitoring Sample Location Map

Univar Solutions USA Inc., NW Yeon Ave Portland, Oregon

Environmental Resources Management
1001 SW 5th St, Suite 1010
Portland, Oregon 97204
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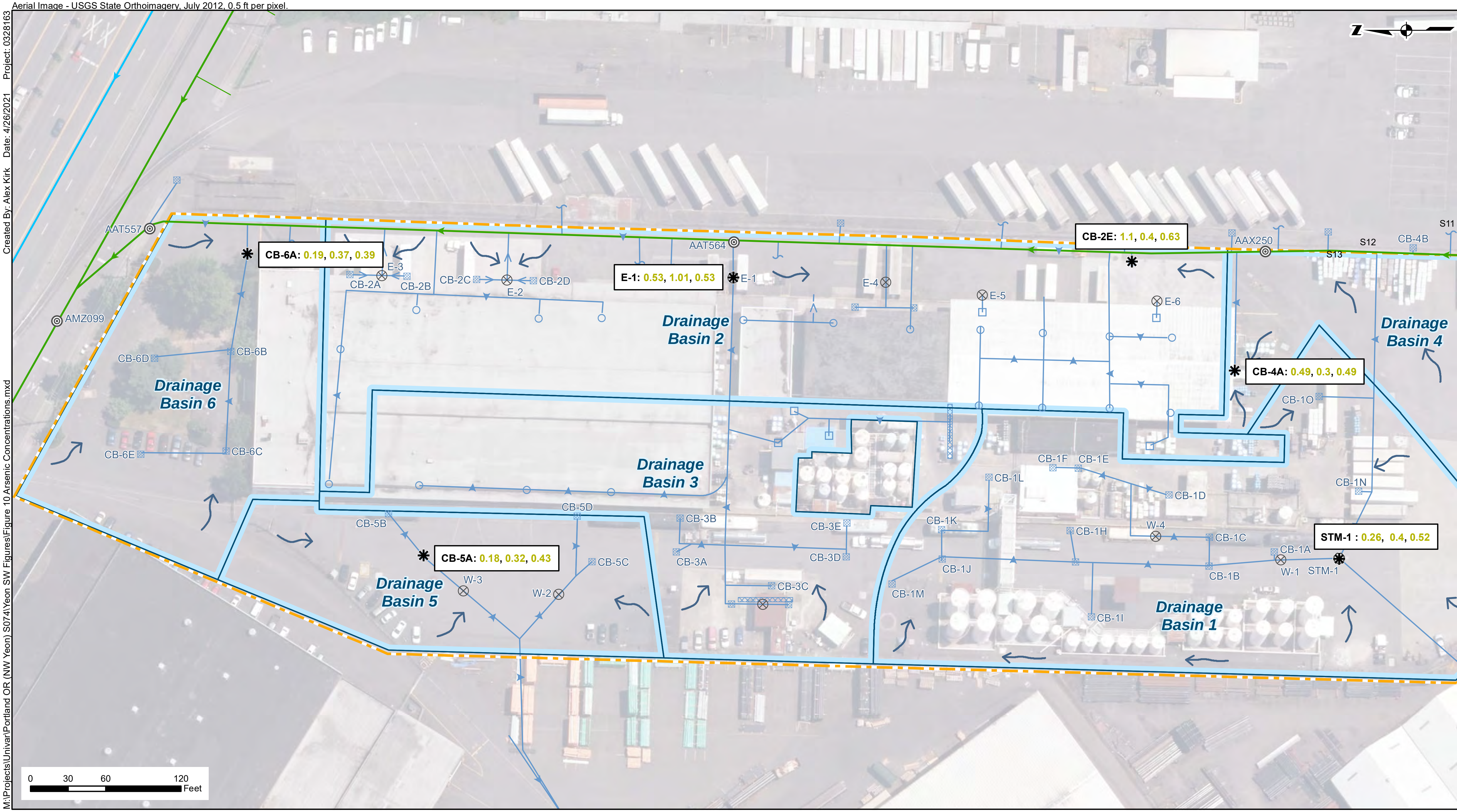
Aerial Image - USGS State Orthoimagery, July 2012, 0.5 ft per pixel.

M:\Projects\Univar\Portland OR (NW Yeon) S074\Yeon SW Figures\Figure 10 Arsenic Concentrations.mxd Created By: Alex Kirk Date: 4/26/2021 Project: 0328163



- Catch Basin
- Floor Drain
- Roof Drain
- SPCC Control Valve
- Storm Manhole
- Trench Drain
- Private Stormwater Pipe
- City Sanitary Sewer Pipes
- City Stormwater Pipe
- City Storm Laterals
- Generalized Surface Flow Direction
- Drainage Basin
- Approximate Univar Property Boundary

Notes:Figure
Yellow results indicate detected concentrations between 10 and 100 times the JSCS SLV.
- All results given in micrograms per liter (µg/L)
- JSCS: Joint source control strategy
- ROD: Record of Decision
- CUL: Cleanup level
- SLV: Portland Harbor ROD CUL supplemented with JSCS screening level values

-- As: Arsenic, SLV = 0.018 µg/L
- All subsurface locations are approximate
* Groundwater infiltration sample results at AAT564 in June 2017 included on figure with stormwater results for comparison purposes
- Shading shown is the highest EQ of analytes listed

Figure 10
Arsenic Concentrations in Stormwater Discharge
Stormwater Source Control Evaluation
Univar USA Inc., NW Yeon Ave
Portland, Oregon

Environmental Resources Management
1001 SW 5th St, Suite 1010
Portland, Oregon 97204
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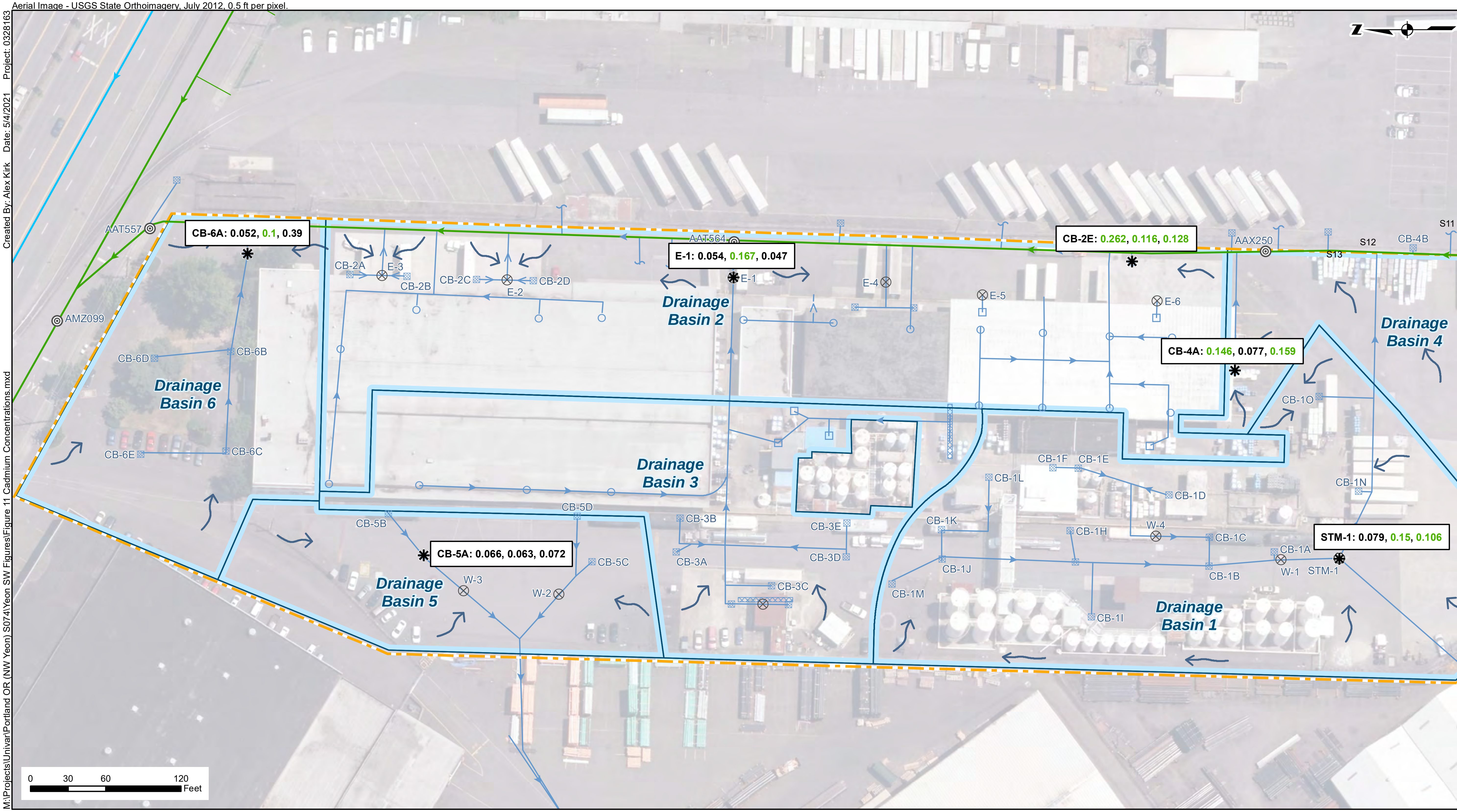
Aerial Image - USGS State Orthoimagery, July 2012, 0.5 ft per pixel.

M:\Projects\Univar\Portland OR (NW Yeon) S074\Yeon SW Figures\Figure 11 Cadmium Concentrations.mxd Created By: Alex Kirk Date: 5/4/2021 Project: 0328163



- Catch Basin
- Floor Drain
- Roof Drain
- SPCC Control Valve
- Storm Manhole
- Trench Drain
- Private Stormwater Pipe
- City Sanitary Sewer Pipes
- City Stormwater Pipe
- City Storm Laterals
- Generalized Surface Flow Direction
- Drainage Basin
- Approximate Univar Property Boundary

Notes:Figure
Green results indicates detected concentrations between 1 and 10 times the JSCS SLV.
- All results given in micrograms per liter (µg/L)
- JSCS: Joint source control strategy
- ROD: Record of Decision
- CUL: Cleanup level
- SLV: Portland Harbor ROD CUL supplemented with JSCS screening level values
- Cd: Cadmium, SLV = 0.094 µg/L
- All subsurface locations are approximate
* Groundwater infiltration sample results at AAT564 in June 2017 included on figure with stormwater results for comparison purposes
- Shading shown is the highest EQ of analytes listed

Figure 11

Cadmium Concentrations in Stormwater Discharge
Stormwater Source Control Evaluation
Univar USA Inc., NW Yeon Ave
Portland, Oregon

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Portland, Oregon 97204
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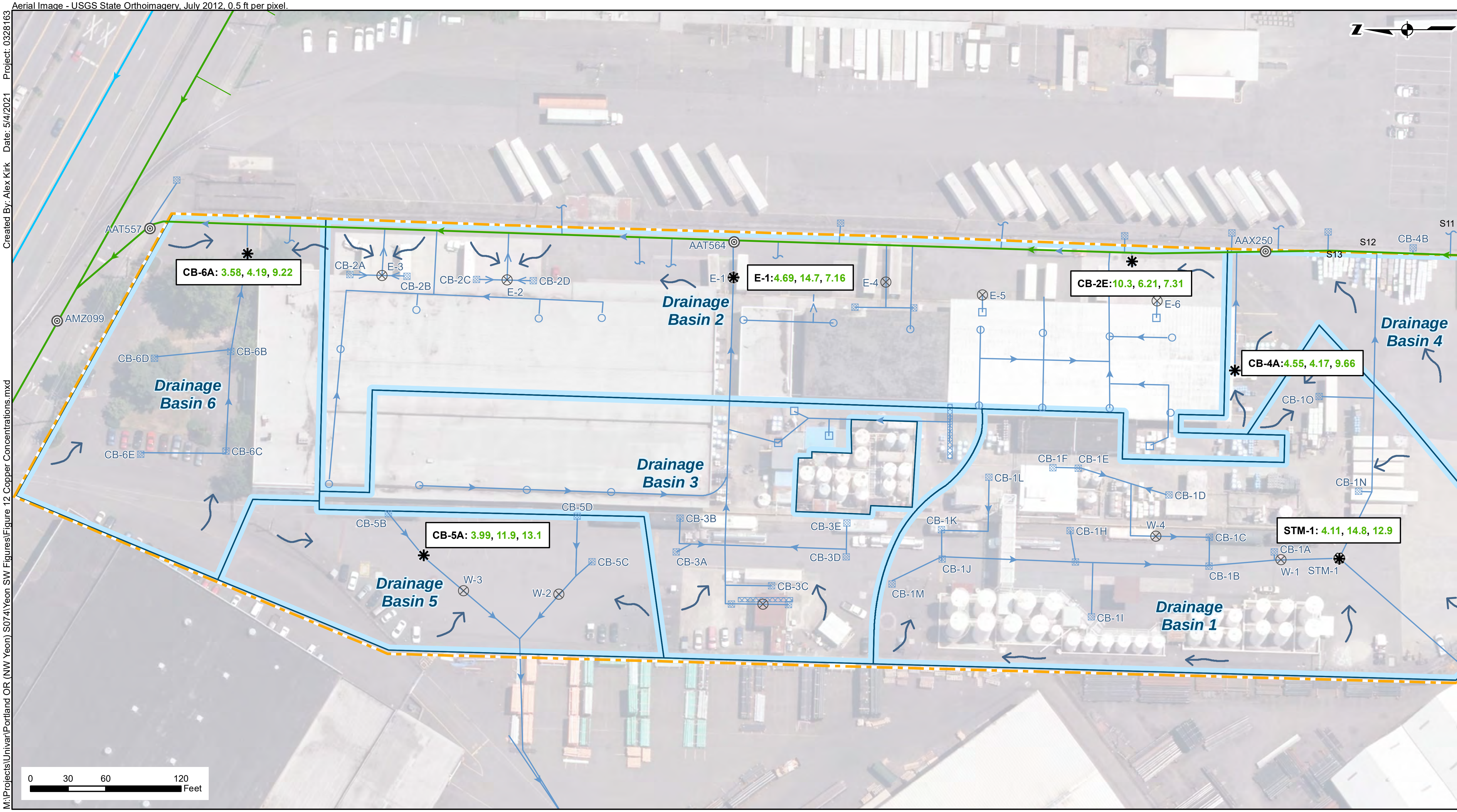
Aerial Image - USGS State Orthoimagery, July 2012, 0.5 ft per pixel.



Catch Basin
Floor Drain
Roof Drain
SPCC Control Valve
Storm Manhole
Trench Drain
Private Stormwater Pipe
City Sanitary Sewer Pipes
City Stormwater Pipe
City Storm Laterals
Generalized Surface Flow Direction
Drainage Basin
Approximate Univar Property Boundary

Notes:Figure values

Green results indicate detected concentrations between 1 and 10 times the JSCS SLV.

- All results given in micrograms per liter (µg/L)
- JSCS: Joint source control strategy
- ROD: Record of Decision
- CUL: Cleanup level
- SLV: Portland Harbor ROD CUL supplemented with JSCS screening level
- Cu: Copper, SLV = 2.74 µg/L
- All subsurface locations are approximate

* Groundwater infiltration sample results at AAT564 in June 2017 included on figure with stormwater results for comparison purposes

- Shading shown is the highest EQ of analytes listed

Figure 12

Copper Concentrations in Stormwater Discharge
Stormwater Source Control Evaluation
Univar USA Inc., NW Yeon Ave
Portland, Oregon

Environmental Resources Management
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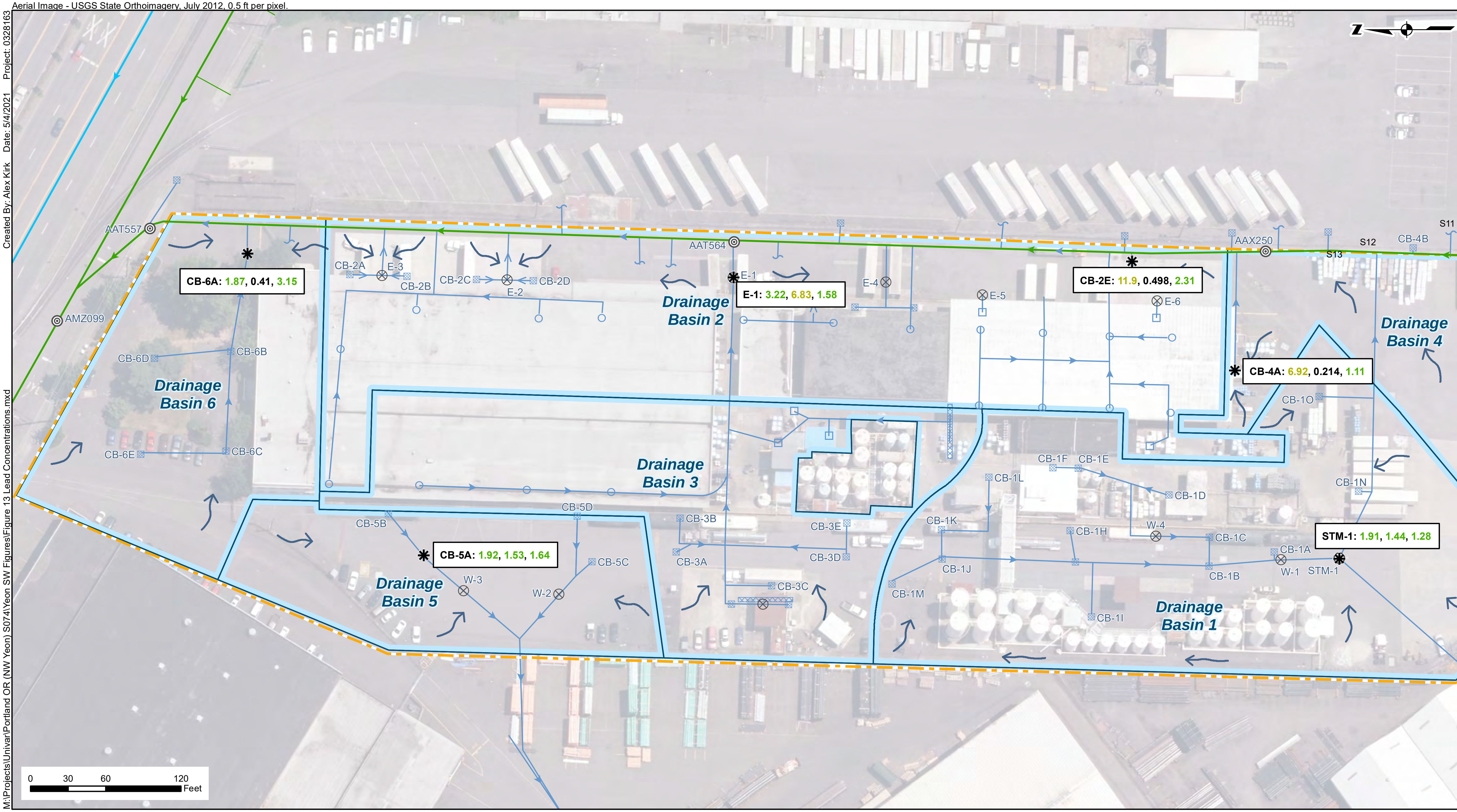
M:\Projects\Univar\Portland OR (NW Yeon) S074\Yeon SW Figures\Figure 12 Copper Concentrations.mxd Created By: Alex Kirk Date: 5/4/2021 Project: 0328163

Aerial Image - USGS State Orthoimagery, July 2012, 0.5 ft per pixel.

Created By: Alex Kirk Date: 5/4/2021 Project: 0328163

M:\Projects\Univar\Portland OR (NW Yeon) S074\Yeon SW Figures\Figure 13 Lead Concentrations.mxd



Catch Basin
Floor Drain
Roof Drain
SPCC Control Valve
Storm Manhole
Trench Drain
Private Stormwater Pipe
City Sanitary Sewer Pipes
City Stormwater Pipe
City Storm Laterals
Generalized Surface Flow Direction
Drainage Basin
Approximate Univar Property Boundary

Notes:Figure
Green results indicate detected concentrations between 1 and 10 times the JSCS SLV.
Yellow results indicate detected concentrations between 10 and 100 times the JSCS SLV.
- All results given in micrograms per liter (µg/L)
- JSCS: Joint source control strategy
- ROD: Record of Decision
- CUL: Cleanup level
- SLV: Portland Harbor ROD CUL supplemented with JSCS screening level values
- Pb: Lead, SLV = 0.54 µg/L
- All subsurface locations are approximate
* Groundwater infiltration sample results at AAT564 in June 2017 included on figure with stormwater results for comparison purposes
- Shading shown is the highest EQ of

Figure 13
Lead Concentrations in Stormwater Discharge
Stormwater Source Control Evaluation
Univar USA Inc., NW Yeon Ave
Portland, Oregon

Environmental Resources Management
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Portland, Oregon 97204
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Aerial Image - USGS State Orthoimagery, July 2012, 0.5 ft per pixel.

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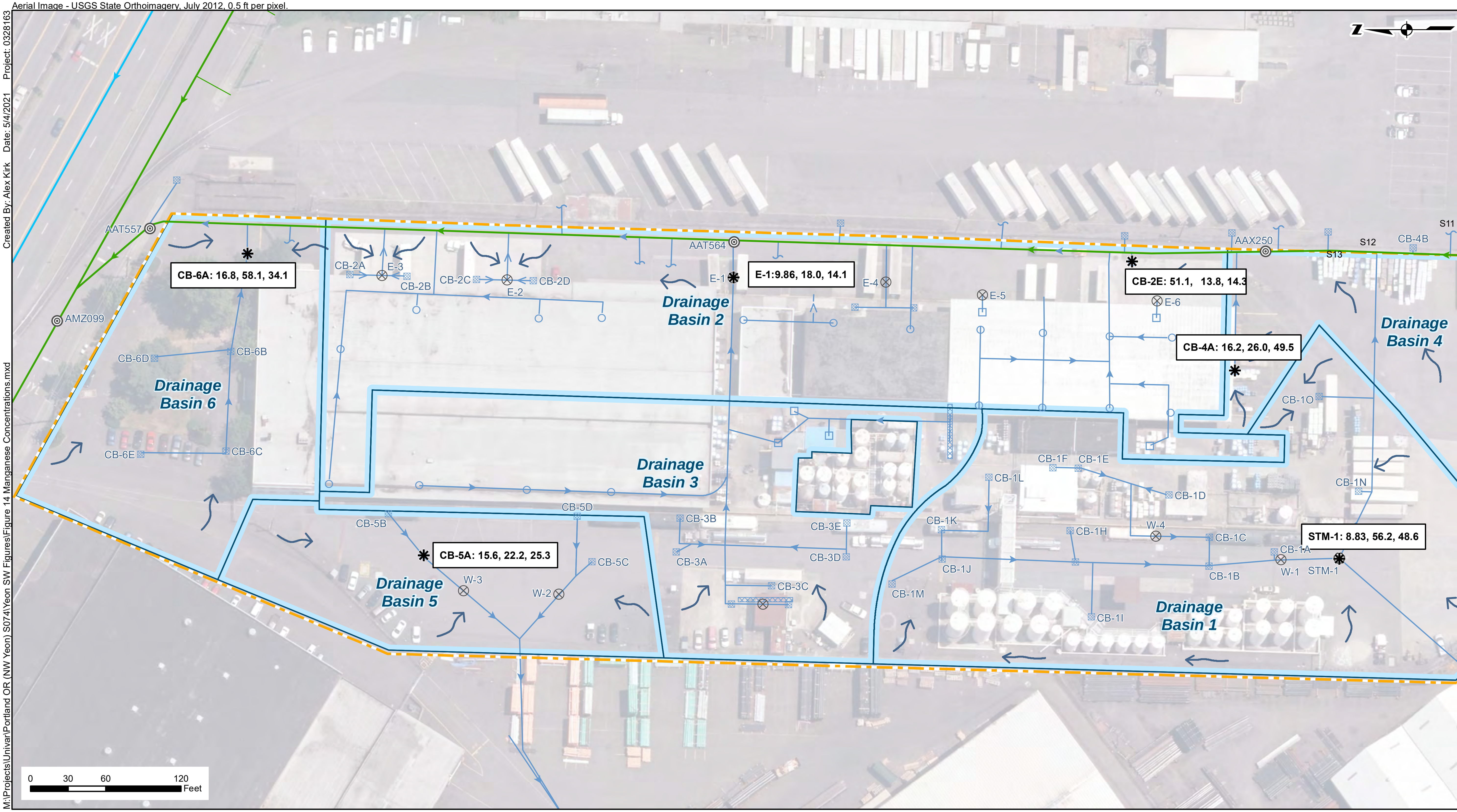

Catch Basin
Floor Drain
Roof Drain
SPCC Control Valve
Storm Manhole
Trench Drain
Private Stormwater Pipe
City Sanitary Sewer Pipes
City Stormwater Pipe
City Storm Laterals
Generalized Surface Flow Direction
Drainage Basin
Approximate Univar Property Boundary

Notes:Figure
- All results given in micrograms per liter (µg/L)
- JSCS: Joint source control strategy
- ROD: Record of Decision
- CUL: Cleanup level
- SLV: Portland Harbor ROD CUL supplemented with JSCS screening level values
-Manganesel SLV = 100 µg/L
- All subsurface locations are approximate

* Groundwater infiltration sample results at AAT564 in June 2017 included on figure with stormwater results for comparison purposes
- Shading shown is the highest EQ of analytes listed

Figure 14

Manganese Concentrations in Stormwater Discharge
Stormwater Source Control Evaluation
Univar USA Inc., NW Yeon Ave
Portland, Oregon

Environmental Resources Management
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Portland, Oregon 97204
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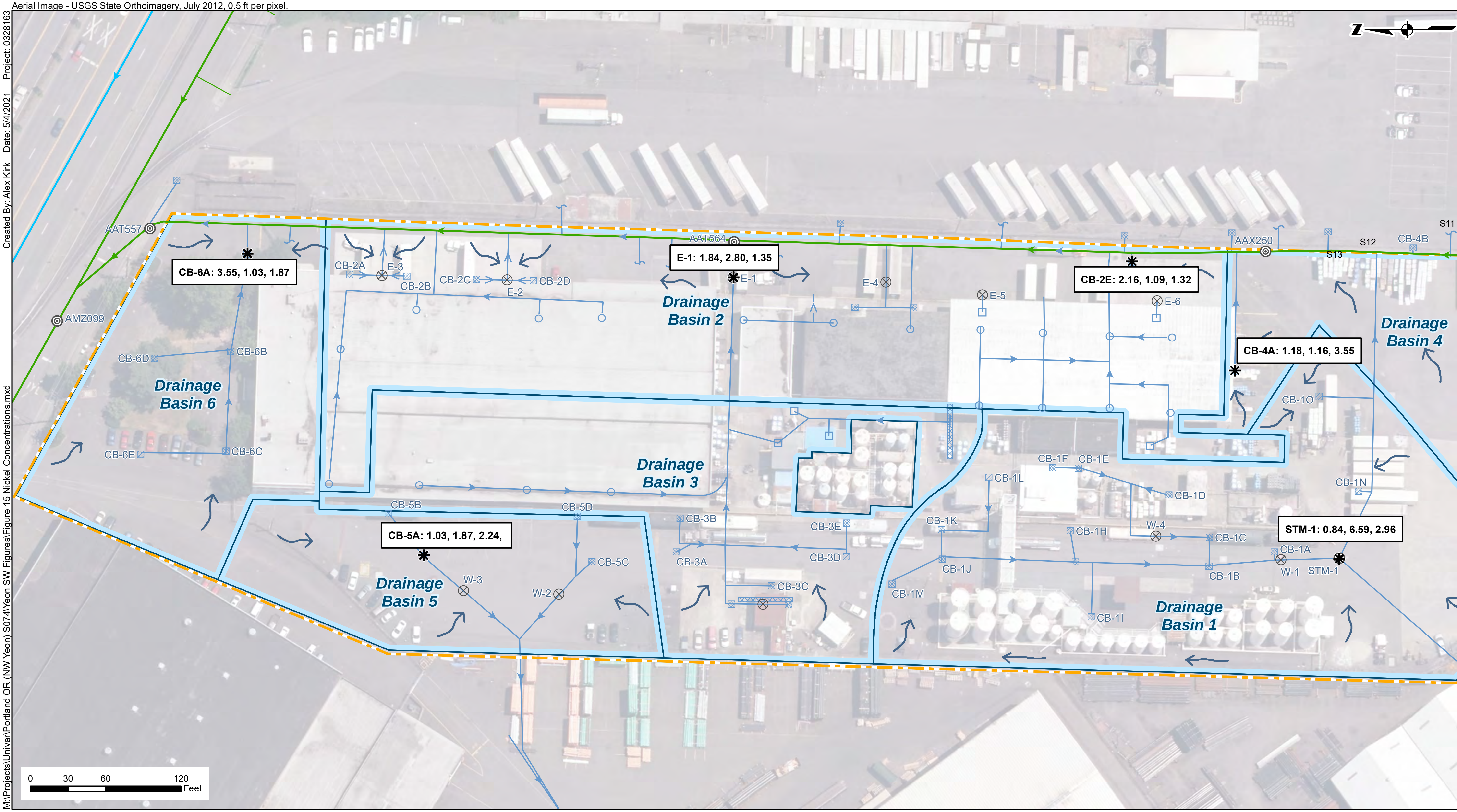
Aerial Image - USGS State Orthoimagery, July 2012, 0.5 ft per pixel.

Created By: Alex Kirk Date: 5/4/2021 Project: 0328163

M:\Projects\Univar\Portland OR (NW Yeon) S074\Yeon SW Figures\Figure 15 Nickel Concentrations.mxd



Catch Basin
Floor Drain
Roof Drain
SPCC Control Valve
Storm Manhole
Trench Drain
Private Stormwater Pipe
City Sanitary Sewer Pipes
City Stormwater Pipe
City Storm Laterals
Generalized Surface Flow Direction
Drainage Basin
Approximate Univar Property Boundary

Notes:Figure
- All results given in micrograms per liter (µg/L)
- JSCS: Joint source control strategy
- ROD: Record of Decision
- CUL: Cleanup level
- SLV: Portland Harbor ROD CUL supplemented with JSCS screening level values
-Nickel SLV = 16 µg/L
- All subsurface locations are approximate

* Groundwater infiltration sample results at AAT564 in June 2017 included on figure with stormwater results for comparison purposes
- Shading shown is the highest EQ of analytes listed

Figure 15

Nickel Concentrations in Stormwater Discharge
Stormwater Source Control Evaluation
Univar USA Inc., NW Yeon Ave
Portland, Oregon

Environmental Resources Management
1001 SW 5th St, Suite 1010
Portland, Oregon 97204
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Aerial Image - USGS State Orthoimagery, July 2012, 0.5 ft per pixel.

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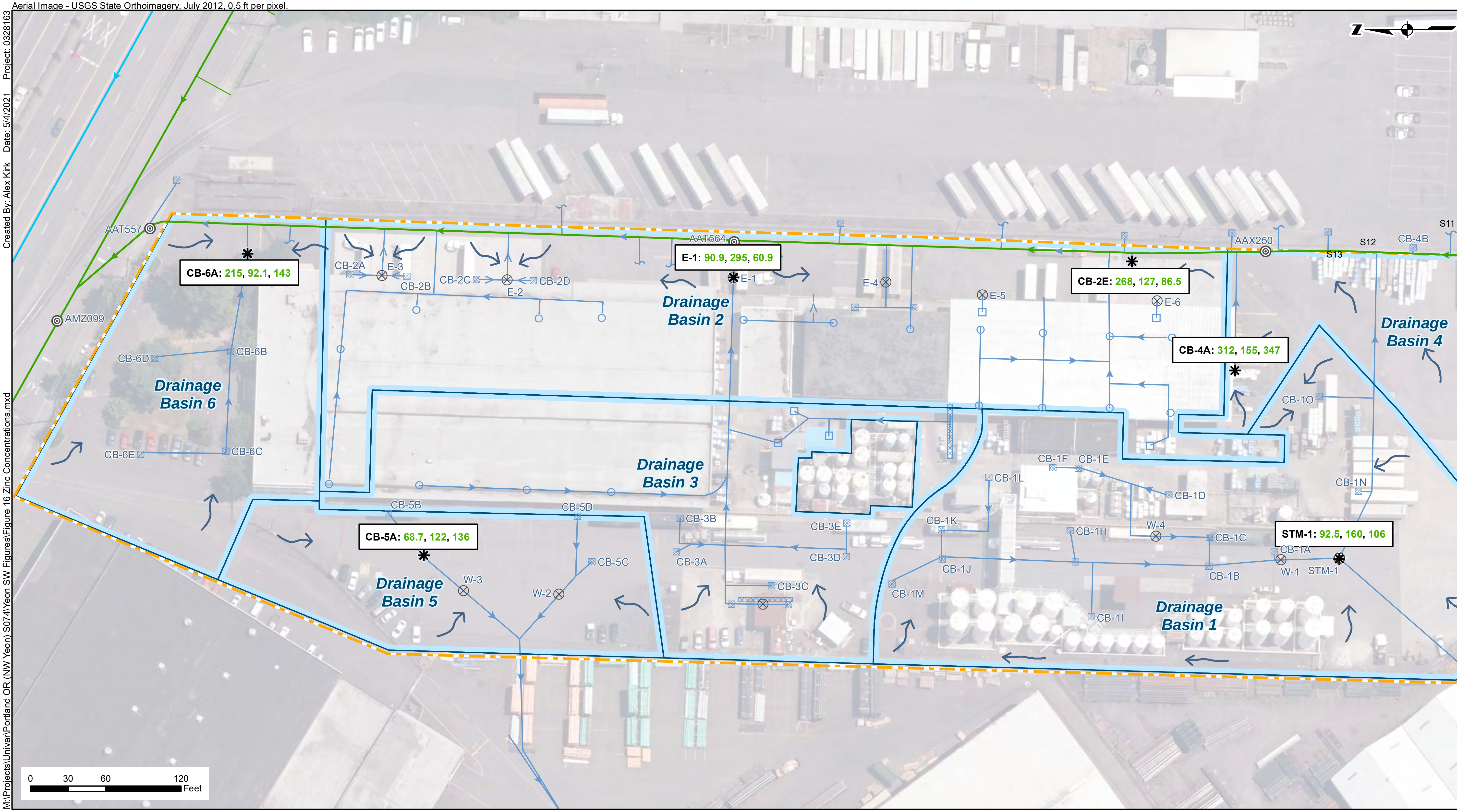

- Catch Basin
- Floor Drain
- Roof Drain
- SPCC Control Valve
- Storm Manhole
- Trench Drain
- Private Stormwater Pipe
- City Sanitary Sewer Pipes
- City Stormwater Pipe
- City Storm Laterals
- Generalized Surface Flow Direction
- Drainage Basin
- Approximate Univar Property Boundary

Notes:Figure values

Green results indicate detected concentrations between 1 and 10 times the JSCS SLV.

- All results given in micrograms per liter (µg/L)
- JSCS: Joint source control strategy
- ROD: Record of Decision
- CUL: Cleanup level
- SLV: Portland Harbor ROD CUL supplemented with JSCS screening level
- Z n: Z inc, SLV = 36.5 µg/L
- All subsurface locations are approximate

* Groundwater infiltration sample results at AAT564 in June 2017 included on figure with stormwater results for comparison purposes

- Shading shown is the highest EQ of analytes listed

Figure 16

Zinc Concentrations in Stormwater Discharge
Stormwater Source Control Evaluation
Univar USA Inc., NW Yeon Ave
Portland, Oregon

Environmental Resources Management
1001 SW 5th St, Suite 1010
Portland, Oregon 97204
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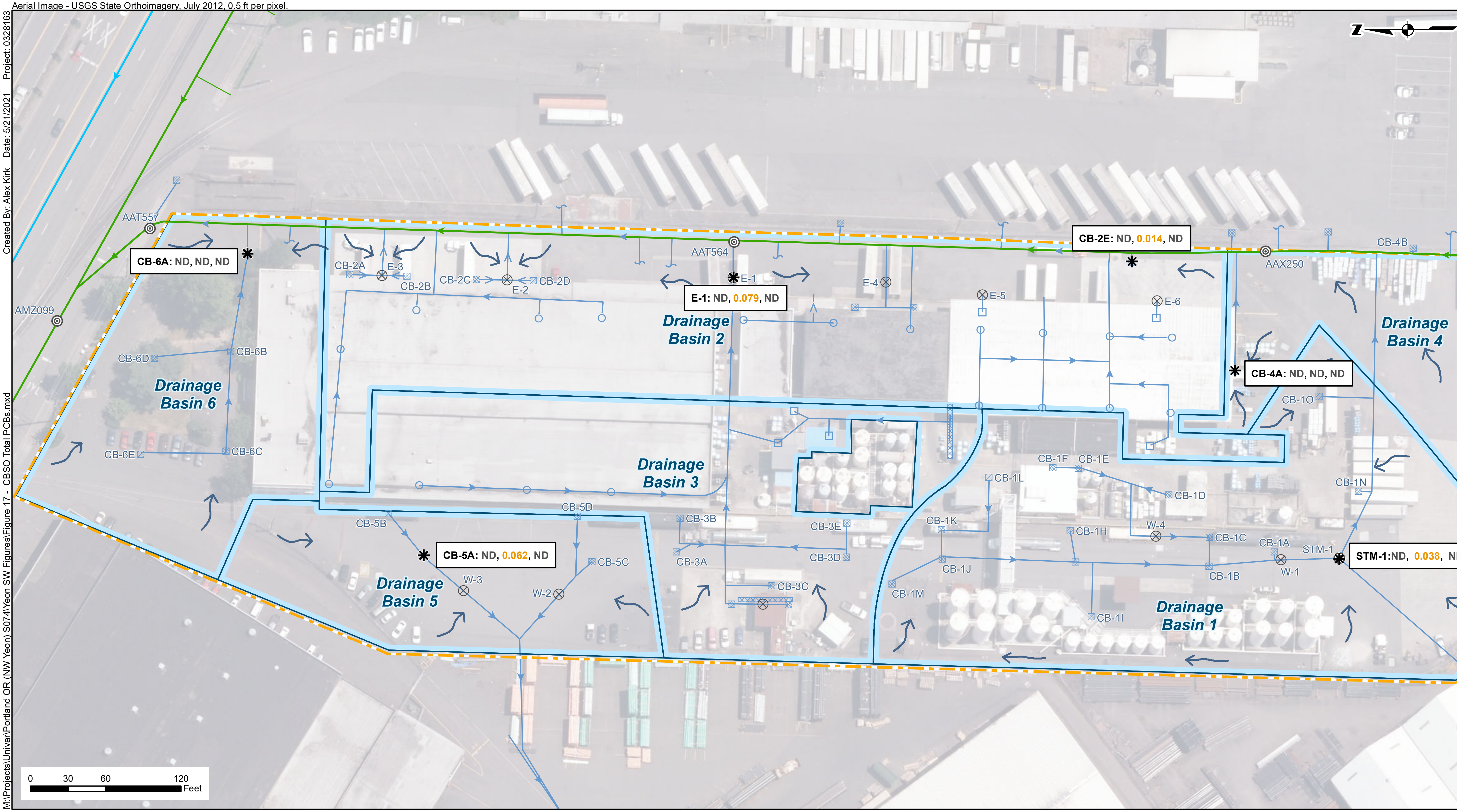
Aerial Image - USGS State Orthoimagery, July 2012, 0.5 ft per pixel.



M:\Projects\Univar\Portland OR (NW Yeon) S074\Yeon SW Figures\Figure 17 - CBSO Total PCBs.mxd Created By: Alex Kirk Date: 5/21/2021 Project: 0328163

Catch Basin
Floor Drain
Roof Drain
SPCC Control Valve
Storm Manhole
Trench Drain
Private Stormwater Pipe
City Sanitary Sewer Pipes
City Stormwater Pipe
City Storm Laterals
Generalized Surface Flow Direction
Drainage Basin
Approximate Univar Property Boundary

Notes:
Orange results indicate detected concentrations greater than 100 times the JSCS SLV.
Grey results indicate non-detects.
- All results given in micrograms per liter (µg/L)
- JSCS: Joint source control strategy
- ROD: Record of Decision
- CUL: Cleanup level
- SLV: Portland Harbor ROD CUL supplemented with JSCS screening level values
- Total PCBs: Total polychlorinated biphenyls, SLV = 0.0000064 µg/L
- All subsurface locations are approximate
- ND = Analyte not detected in any sample above the method detection limit
* Aroclor 1268 was the only detected PCB.

Figure 17
Total PCB Concentrations in Stormwater Discharge*
Stormwater Source Control Effectiveness Evaluation
Univar Solutions USA Inc., NW Yeon Ave
Portland, Oregon

Environmental Resources Management
1001 SW 5th St, Suite 1010
Portland, Oregon 97204
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Aerial Image - USGS State Orthoimagery, July 2012, 0.5 ft per pixel.

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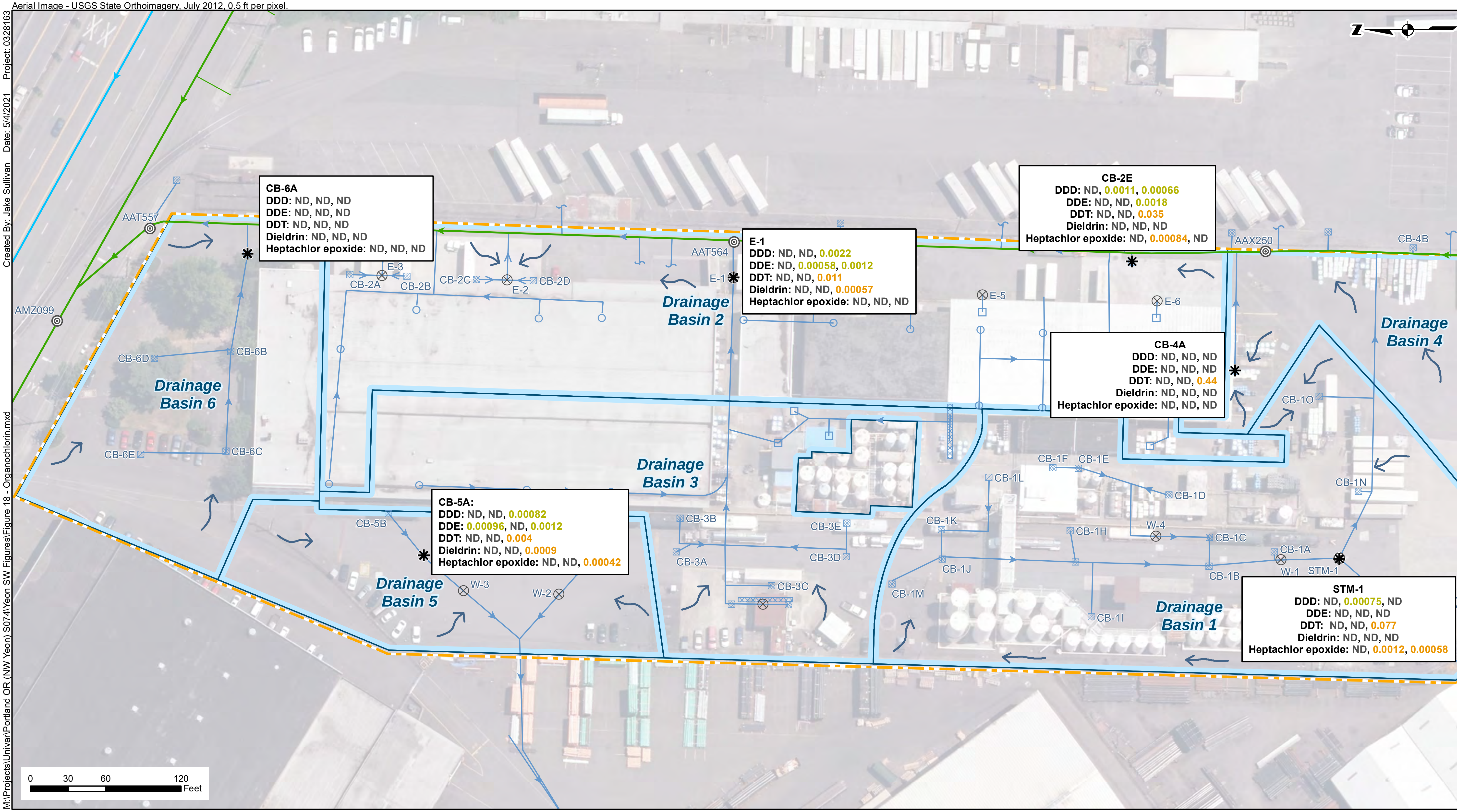


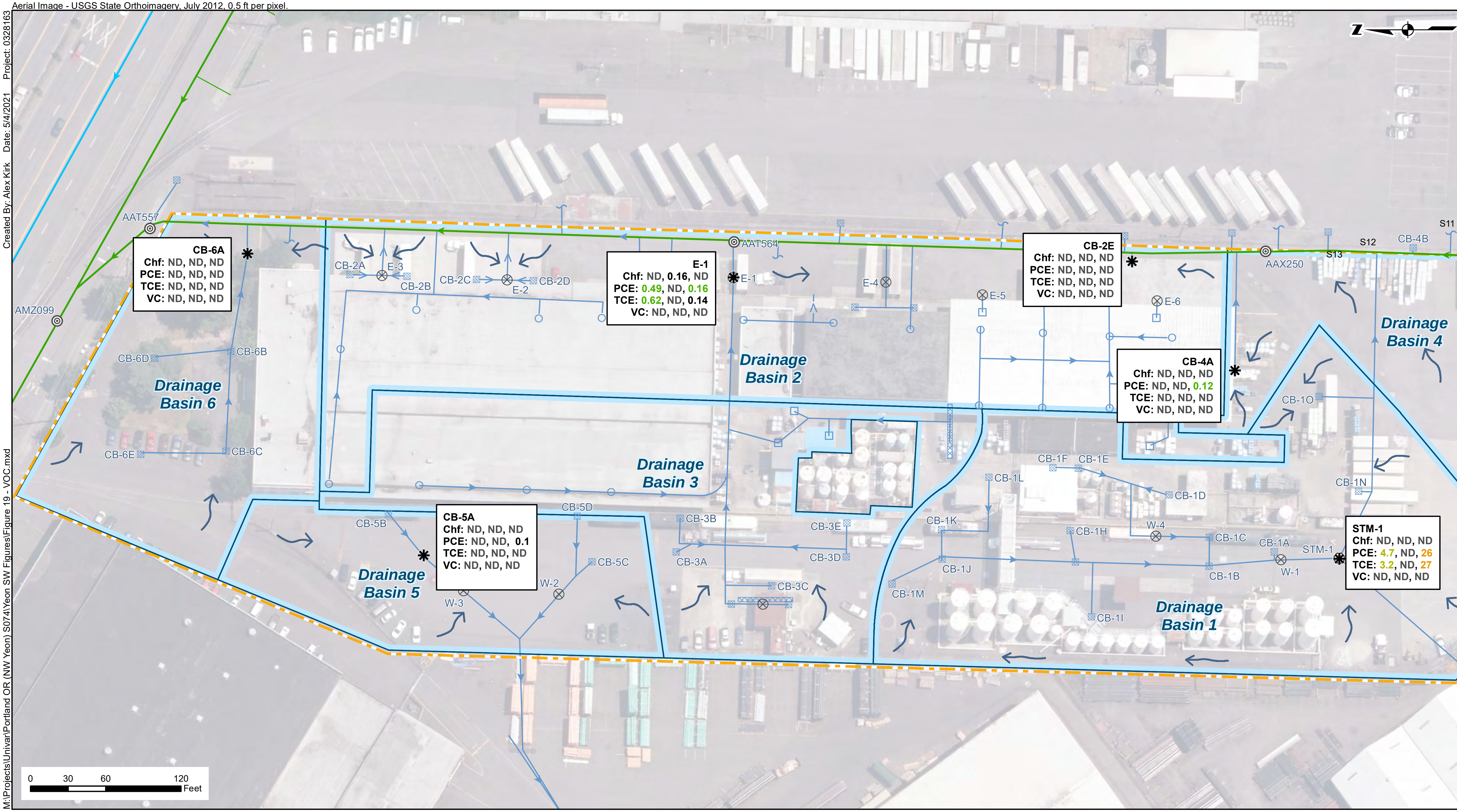
- Catch Basin
- Floor Drain
- Roof Drain
- SPCC Control Valve
- Storm Manhole
- Trench Drain
- Private Stormwater Pipe
- City Sanitary Sewer Pipes
- City Stormwater Pipe
- City Storm Laterals
- Generalized Surface Flow Direction
- Drainage Basin
- Approximate Univar Property Boundary

Notes:
Orange results indicate detected concentrations greater than 100 times the JSCS SLV.
Yellow results indicate detected concentrations between 10 and 100 times the JSCS SLV.
Grey results indicate non-detects.
- All results given in micrograms per liter (µg/L)
- JSCS: Joint source control strategy
- ROD: Record of Decision
- CUL: Cleanup level
- SLV: Portland Harbor ROD CUL supplemented with JSCS screening level values
- 4,4'-DDE, SLV = 0.000022 (µg/L)
- 4,4'-DDT, SLV = 0.000022 (µg/L)
- DI: Dieldrin, SLV = 0.0000054 (µg/L)
- Heptachlor, SLV = 0.0000039 (µg/L)
- All subsurface locations are approximate
- Shading shown is the highest EQ of analytes listed
-ND = Analyte not detected in any sample above the method detection limit

Figure 18
Organochlorine Concentrations in Stormwater Discharge
Stormwater Source Control Effectiveness Evaluation
Univar Solutions USA Inc., NW Yeon Ave
Portland, Oregon

Environmental Resources Management
1001 SW 5th St, Suite 1010
Portland, Oregon 97204
ERM.

Aerial Image - USGS State Orthoimagery, July 2012, 0.5 ft per pixel.



Catch Basin
Floor Drain
Roof Drain
SPCC Control Valve
Storm Manhole
Trench Drain
Private Stormwater Pipe
City Sanitary Sewer Pipes
City Stormwater Pipe
City Storm Laterals
Generalized Surface Flow Direction
Drainage Basin
Approximate Univar Property Boundary

Notes:
Orange results indicate detected concentrations greater than 100 times the JSCS SLV.
Yellow results indicate detected concentrations between 10 and 100 times the JSCS SLV.
Green results indicate detected concentrations between 1 and 10 times the JSCS SLV.
Grey results indicate non-detects.
- All results given in micrograms per Liter (µg/L)
- JSCS: Joint source control strategy
- ROD: Record of Decision
- CUL: Cleanup level
- SLV: Portland Harbor ROD CUL supplemented with JSCS screening level values
- Chf: Chloroform, SLV = 0.17 µg/L
- PCE: Tetrachloroethene, SLV = 0.12 µg/L
- TCE: Trichloroethene, SLV = 0.17 µg/L
- VC: Vinyle Chloride, SLV = 0.015 µg/L
- All subsurface locations are approximate
- *Groundwater infiltration sample results at AAT564 in June 2017 included on figure with stormwater results for comparison purposes
- Shading shown is the highest EQ of analytes listed
- ND = Analyte not detected above the method detection limit

Figure 19

Total VOC Concentrations in Stormwater Discharge
Stormwater Source Control Effectiveness Evaluation
Univar Solutions USA Inc., NW Yeon Ave
Portland, Oregon

Environmental Resources Management
1001 SW 5th St, Suite 1010
Portland, Oregon 97204
ERM.

Aerial Image - USGS State Orthoimagery, July 2012, 0.5 ft per pixel.

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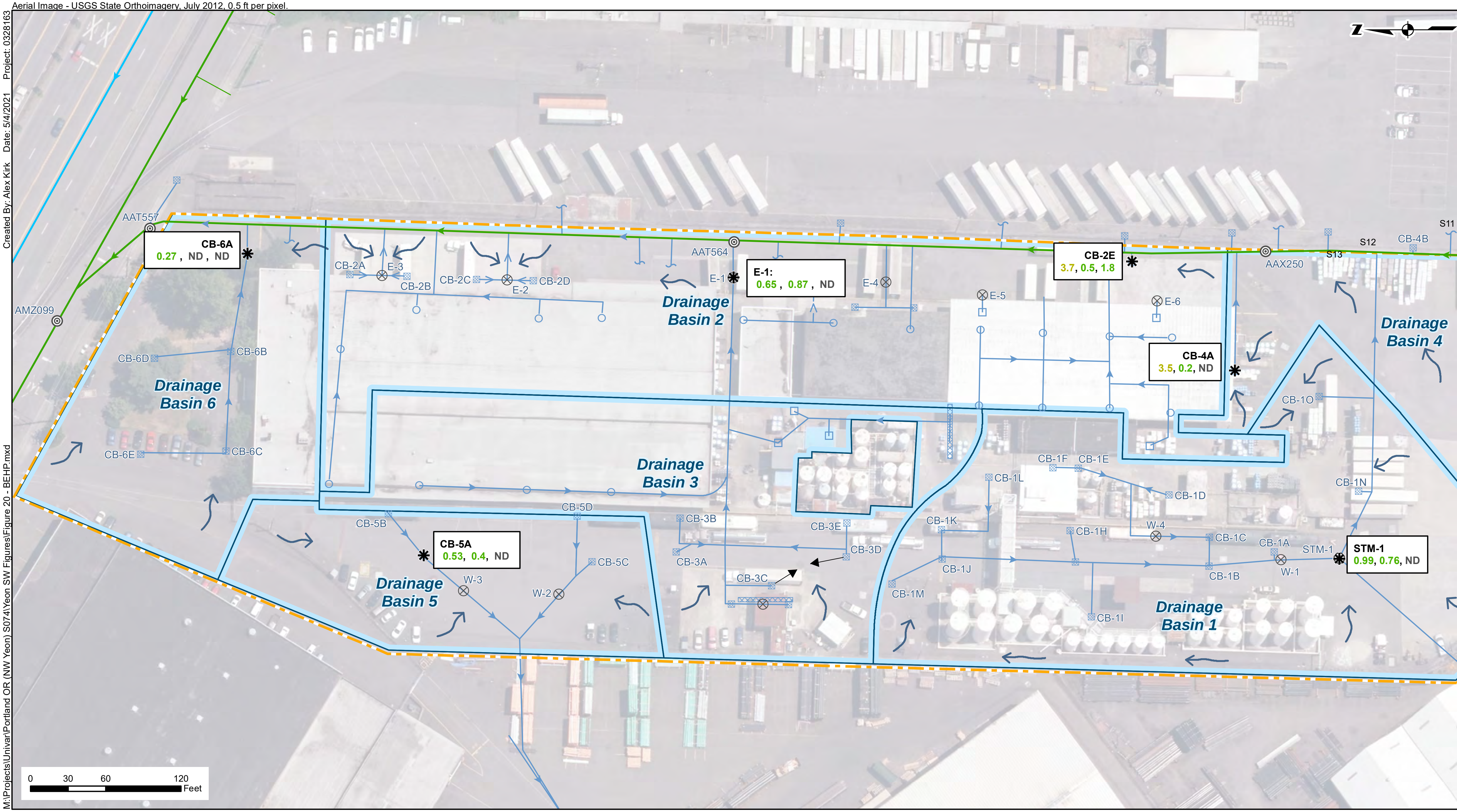

- Catch Basin
- Floor Drain
- Roof Drain
- SPCC Control Valve
- Storm Manhole
- Trench Drain
- Private Stormwater Pipe
- City Sanitary Sewer Pipes
- City Stormwater Pipe
- City Storm Laterals
- Generalized Surface Flow Direction
- Drainage Basin
- Approximate Univar Property Boundary

Notes:
Yellow results indicate detected concentrations between 10 and 100 times the JSCS SLV.
Green results indicate detected concentrations between 1 and 10 times the JSCS SLV.
Grey results indicate non-detects.
- All results given in micrograms per liter (µg/L)
- JSCS: Joint source control strategy
- ROD: Record of Decision
- CUL: Cleanup level
- SLV: Portland Harbor ROD CUL supplemented qith JSCS screening level values
- BEHP: bis(2-Ethylhexyl)phthalate, SLV = 0.2 µg/L
- All subsurface locations are approximate
- *Groundwater infiltration sample results at AAT564 in June 2017 included on figure with stormwater results for comparison purposes
- Shading shown is the highest EQ of analytes listed

Figure 20
BEHP Concentrations in Stormwater Discharge
Stormwater Source Control Effectiveness Evaluation
Univar Solutions USA Inc., NW Yeon Ave
Portland, Oregon

Environmental Resources Management
1001 SW 5th St, Suite 1010
Portland, Oregon 97204
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Aerial Image - USGS State Orthoimagery, July 2012, 0.5 ft per pixel.

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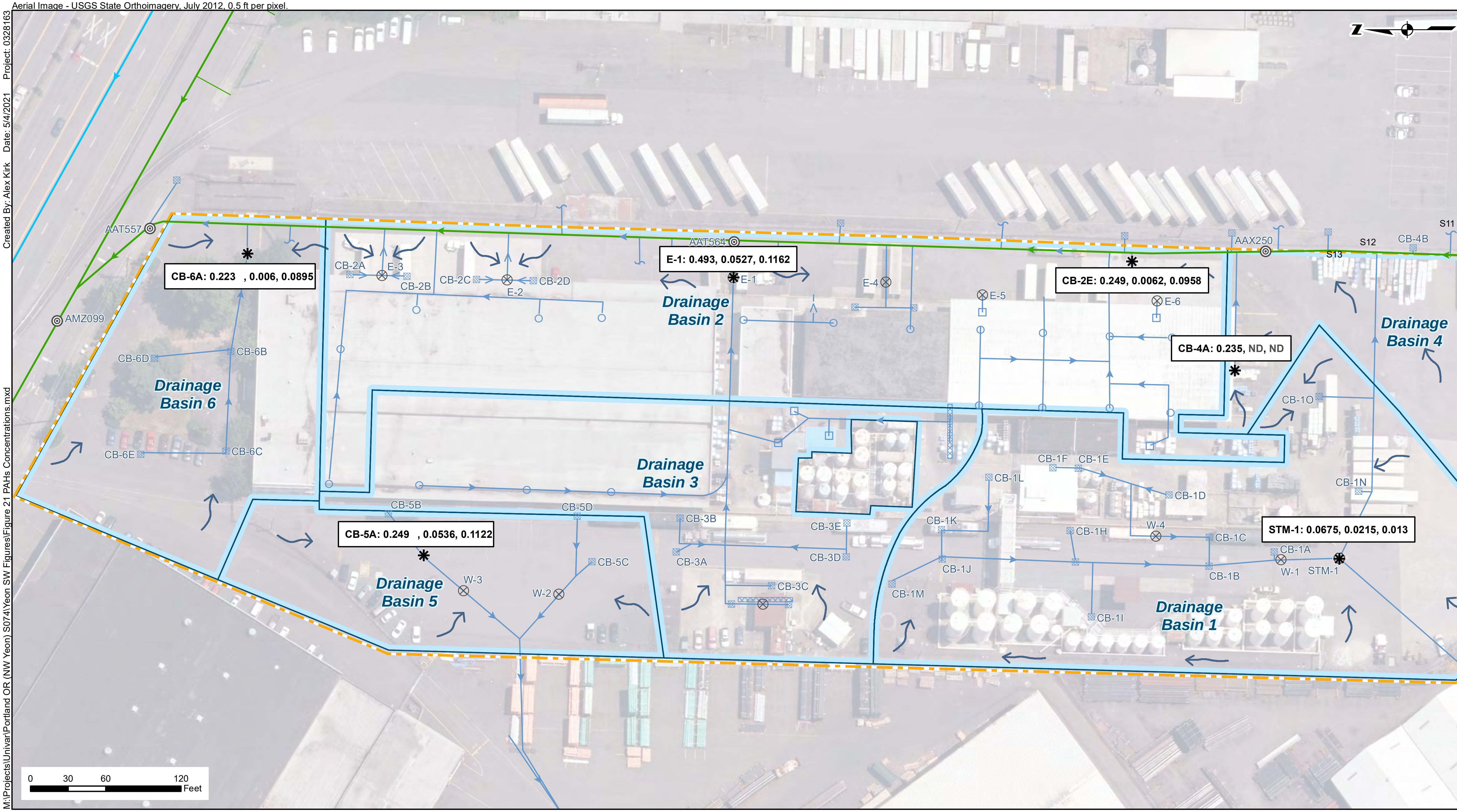

- Catch Basin
- Floor Drain
- Roof Drain
- SPCC Control Valve
- Storm Manhole
- Trench Drain
- Private Stormwater Pipe
- City Sanitary Sewer Pipes
- City Stormwater Pipe
- City Storm Laterals
- Generalized Surface Flow Direction
- Drainage Basin
- Approximate Univar Property Boundary

Notes:Figure
- All results given in micrograms per liter (µg/L)
- JSCS: Joint source control strategy
- ROD: Record of Decision
- CUL: Cleanup level
- SLV: Portland Harbor ROD CUL supplemented with JSCS screening level values
- All subsurface locations are approximate
* Groundwater infiltration sample results at AAT564 in June 2017 included on figure with stormwater results for comparison purposes
- Shading shown is the highest EQ of analytes listed

Figure 21
PAHs Concentrations in Stormwater Discharge
Stormwater Source Control Evaluation
Univar USA Inc., NW Yeon Ave
Portland, Oregon

Environmental Resources Management
1001 SW 5th St, Suite 1010
Portland, Oregon 97204
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APPENDIX A SWSCE RESULTS